

# LILIES

and Related Plants

2009-2010





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and Related Plants  
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## Lilies and Related Plants

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- Front cover:** One of Charlie Kroell's Purple Fleck Type hybrids. (see pp. 22-30)
- Back cover:** *Lilium* 'Garden Society' (*L. occidentale* x North American hybrid), a lily hybridised by Tim Whiteley, which was shown at the 2009 Chelsea Flower Show by Richard Hyde.
- Half title:** *Lilium pyrenaicum*, one of the lilies discussed in *European Lilies Untangled* by Iain Brodie. (see pp. 92-102)
- Royal Horticultural Society Lily Group page:** *Lilium bansonii*. (see pp. 40-42)
- Contents page:** An LA hybrid, 'Fangio'. (see pp. 16-18)

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Editor  
Alan Mitchell

The Royal Horticultural Society  
LILY GROUP

# Royal Horticultural Society Lily Group



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# Contents



Notes on Authors .....	1-2
<b>An enquiry into the development and conservation of Mylnefield Lilies (a.k.a. North hybrids)</b> <i>by Jane Robertson</i> .....	<b>3-9</b>
<b>New interest in <i>Lilium iridollae</i></b> <i>by Marianne Casey</i> .....	<b>10-15</b>
<b>Lilies at Eden</b> <i>by Helen Lannon</i> .....	<b>16-18</b>
<b><i>Trillium chloropetalum</i></b> <i>by Isa Hall</i> .....	<b>19-21</b>
<b>A love affair</b> <i>by Charlie Kroell</i> .....	<b>22-30</b>
<b>My experience of growing <i>Fritillaria</i> in a garden near Moscow</b> <i>by Konstantin Aleksandrov</i> .....	<b>31-34</b>
<b>Henry John Elwes (1846 to 1922)</b> <i>by Iain Ferguson</i> .....	<b>35-39</b>
<b>Peter Hanson and <i>Lilium hansonii</i></b> <i>by William T. Stearn</i> .....	<b>40-42</b>
<b>Some general thoughts on heredity especially as they relate to Autotetraploidy</b> <i>by Robert A. Griesbach</i> .....	<b>43-53</b>
<b>News from the old <i>martagon</i> country</b> <i>by Petr Šrůtka</i> .....	<b>54-59</b>
<b><i>Lilium bulbiferum</i> in Val Bavona (2008)</b> <i>by Pontus Wallstén</i> .....	<b>60-65</b>

# Contents

<b>Growing lilies in Guatemala</b> <i>by Mary Belle Frey</i> . . . . .	<b>66-70</b>
<b>Catching the light: the joys of digital photography</b> <i>by Kathleen Mingl</i> . . . . .	<b>70-79</b>
<b>The Ryrube Group</b> <i>by Joe Hoell</i> . . . . .	<b>80-82</b>
<b>Edward Austen McRae (1932 to 2008)</b> <i>by Peter Schenk</i> . . . . .	<b>83-85</b>
<b><i>Lilium polyphyllum</i> – rarest of rare lilies</b> <i>by Anurag Dhyani</i> . . . . .	<b>85-91</b>
<b>European lilies untangled</b> <i>by Iain Brodie</i> . . . . .	<b>92-102</b>
<b>60 years of growing lilies in New Zealand</b> <i>by William F. Doreen</i> . . . . .	<b>103-108</b>
<b>Experiences with lilies over my second forty years</b> <i>by Tom Isaac</i> . . . . .	<b>109-112</b>
<b>Thoughts on the classification of species lilies</b> – past and present <i>by Alan Mitchell</i> . . . . .	<b>113-119</b>
<b>‘Wyattwood’ or what?</b> <i>by Philip Jones</i> . . . . .	<b>120-121</b>
	★      ★      ★
<b>About the RHS Lily Group</b> . . . . .	<b>122</b>
<b>Index</b> . . . . .	<b>123-125</b>
<b>Picture credits</b> . . . . .	<b>125</b>
<b>Guidelines for authors</b> . . . . .	<b>126</b>

# NOTES ON AUTHORS

**Jane Robertson** was initially attracted to lilies by their exotic beauty. In particular, she became drawn to turkscap lilies, because of their elegance. Apart from being an avid gardener, Jane recently completed a BSc Horticulture with Plantsmanship at the Royal Botanic Garden Edinburgh.

**Marianne Casey** has made a hobby of studying species lilies and their hybrids for over a decade, having been initially captivated by 'Connecticut King' in a nearby garden. She currently grows two hundred hybrids and many species.

**Helen Lannon** became interested in lilies when she successfully grew a few Oriental hybrid lilies in pots. After joining the Lily Group, she took part in an initiative to conserve North hybrids. In time, Helen's efforts resulted in North hybrids becoming a feature in the lily display at the Eden Project.

**Isa Hall** has grown *Trillium chloropetalum* for many years and admires its beauty and its toughness, which was clearly demonstrated when her *Trillium* bed was submerged under four feet of water when her garden was flooded in 2008.

**Charlie Kroell** has been enamoured with lilies since the mid 1960s and has dabbled in hybridising for nearly as long. For many years now his main interest has been Div. VI, the Trumpet/Aurelians...especially with regard to markings and adornments such as 'black' nectaries and heavy papillae. And, all species, the loveliest of lilies, nature's introductions.

**Konstantin Aleksandrov** Konstantin Aleksandrov's love affair with bulbous flora began as a child helping his parents tend the flower garden at their *dacha* outside Moscow. Having overcome the many difficulties facing keen plantmen in Russia, he went through his narcissus, hyacinth, erythronium and corydalis phases and is now growing an astonishing collection of fritillaries.

**Iain Ferguson** (who was the Chair of the Lily Group from 1978 to 1982) started searching for and growing *Lilium* species in 1968. With the help of Patrick Syngé and overseas contacts he established, by 1975, a collection of some forty species at Pirbright Lodge on sandy neutral soil. In 1989 he moved to Suffolk to a chalk garden and, over a few years, lost all his lilies. Iain is still growing a few species, mostly in pots, in a very small walled garden and, at 77, he is wondering how long it will make sense to continue raising *Lilium* from seed!

**Dr William T. Stearn** (1911 to 2001) was a systematic botanist at the British Museum (Natural History), previously librarian to the RHS. He was a Botanical authority on lilies and with Judge H. Drysdale Woodcock author of *Lilies of the World*, 1950. He also contributed many articles on lilies to the RHSLYB.

**Dr Robert A. Griesbach** is professor emeritus and former chair of the Biology Department at De Paul University, Chicago, with a specialty in genetics. He is a pioneer in the polyploid breeding of garden ornamentals, specifically *Gladiolus*, *Hemerocallis* and *Lilium*. In 1982, after having first converted two of the legendary Leslie Woodriff's masterpiece hybrids, 'Black Beauty' and 'White Henryi', to the tetraploid level, progeny from his cross 4X BB x 4X WH first flowered, becoming the parental generation of what has, in the years since, resulted in a line of extraordinary Orienpet hybrids: beautifully coloured, patterned and formed, robust and hardy. Now, at age eighty-five, Bob continues to pursue his passion with the enthusiasm of a youngster and to produce stunning new lilies with each succeeding generation. (Note provided by Charlie Kroell)



**Petr Šrůtka** has had a lifelong fascination with growing things. He encountered his first lily (*L. bulbiferum*) in his mother's garden and was enthralled by the way the buds elongated, changed colour and then opened to flower. His interest for many years has been *L. martagon* and its hybrids (including his own).

**Pontus Wallstén** has been growing lilies since the age of 13, in his parent's garden in Switzerland. After graduating from a 3 year BA course in Film and TV production at the University of Westminster in London, in June this year, he is now working as a freelance cameraman and photographer. His passion for lilies and rare plants keeps growing, just as his collection of rare plants from all over the world, now consisting of about 250 different species, of which lilies form a big part.

**Mary Belle Frey** is simply in love with lilies: the seeds are exquisite; the cotyledons are a miracle; the seedlings are a delight; the foliage has pattern and movement all year; and the flowers! well, the flowers are entrancing; and the seedpods are perfect containers for their flakes of gold.

**Kathleen Mingl** first became intrigued by lilies about 40 years ago when she moved to a house, in Illinois, where she discovered a colony of *L. henryi* in the garden. When she moved to Oregon and joined the North American Lily Society she developed her interest in lilies to the point of becoming involved with tissue culture and making crosses with *L. henryi* and its hybrids.

**Joe Hoell** lives in Georgetown, Tasmania, and has produced many hybrid lilies. The work he has done with the Ryirube Group has produced attractive lilies that are vigorous in growth and resistant to *Botrytis* and *Fusarium* rot.

**Peter Schenk** is a world-renowned lily hybridizer who worked as a student 40 years ago at the Oregon Bulb Farms. After employment with the Dutch advisory service he joined Bischoff Tulleken Lelies who through his skills have introduced many outstanding cultivars. Peter retired in 2006, but has continued to do consultancy work in Korea and China.

**Anurag Dhyan** is a student at the High Altitude Plant Physiology Research Centre, Srinagar Garhwal, Uttarakhand. The focus of his research is *L. polyphyllum*, which he is studying for its medicinal properties. He is also interested in the conservation of this rare lily.

**Iain Brodie** of Falsyde, formerly a Forestry Consultant in the Scottish Highlands, needing a change of direction turned his small nursery into something larger next door to Auchgourish Botanic Garden where the international conservation collection of botanical *Lilium* is currently maintained including 125, mostly wild origin, botanical taxa now also used as the research resource for his new Monograph on *Lilium*.

**William F. Doreen** has been growing lilies commercially, in New Zealand, for 60 years. After studying at Agricultural College, William started his own nursery, which he called Lilies International Ltd. From this nursery he supplied lilies to customers at home and abroad.

**Tom Isaac** is a retired dairy farmer who feels "there is something magical about lilies." Whether growing lilies in the UK, or in France, Tom has always maintained an interesting collection including North hybrids, which he considers to be lilies with a particularly attractive form and grace.

**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.

**Philip Jones** is the Chaplain at the Carmelite Monastery in Dysart, Fife. He has a particular interest in growing west coast American species.



## **An enquiry into the development and conservation of the Mylnefield lilies (a.k.a. North hybrids)**

*In the following summary, of a specialist project undertaken as part of her studies at the Royal Botanic Garden Edinburgh, **Jane Robertson** presents her findings regarding the development and conservation of the hybrids that resulted from the work of Dr Christopher North.*

### **Background**

As a member of the Hardy Plant Society, I attended a talk in October 2006 about the increasingly scarce lily hybrids known as the Mylnefield Lilies developed at the Scottish Horticultural Research Institute at Mylnefield, near Dundee. During the talk, I realized I was already growing two of these lilies in my garden but had had no idea of their provenance as Scottish cultivars. When asked to embark on a specialist project during the second year of my HND Horticulture with Plantsmanship course at the Royal Botanic Garden Edinburgh, I decided I would like to find out more about the Mylnefield lilies.



***Above Left, 'Angela North', Top right, 'Bronwen North', Above right, 'Peggy North'.***

The primary aim of my project was to research the original breeding programme for the lilies along with the more recent steps being taken to conserve them. I sought to do this by finding out how and why they were first developed and how they had been distributed commercially. I also wanted to find out how widely grown they are now amongst lily enthusiasts particularly in Scotland and The North of England—the area for which they were first intended. Additionally I was interested to find out why they are now so scarce and to evaluate the measures being taken to ensure their survival.

### **Approach to project**

Information was gathered through primary and secondary research. Primary



***Above right, 'Ariadne', Top left, 'Theseus', Above left, Group of North Ladies.***

research mainly consisted of interviewing key people involved in the breeding or in the conservation of the lilies. These included

- Alan Mitchell, personal friend of Dr Christopher North, lily grower and member of the RHS Lily Group who proposed the current conservation programme of bulb sharing and scaling.
- Dr Peter Waister, former colleague of Dr North at Mylnefield who subsequently went on to grow and sell North hybrids at his nursery, Balruddery Lilies.
- Steve McNamara, Head Gardener NTS, Branklyn Garden, Perth holder of the National Collection of Mylnefield Lilies.

- Kirstie McManus—formerly of Border Belles Nursery. Dr North set up a project through Border Belles Nursery with the aim of making North Hybrids available commercially. After leaving Border Belles nursery, Kirstie continued with this project alone.

I also conducted a survey of RHS lily group members in Scotland and the North of England and made contact with commercial growers of the hybrids, past and present, both inside and outside the UK.

Secondary research was done using the invaluable CD Rom produced by Dr North himself containing detailed information of the breeding programme. I also consulted recent and past issues of periodicals, journals and books containing information on the hybrids and used the recently launched website—‘The Lilies of Dr Christopher North’.

### **The breeding programme**

I found out through this research that the Mylnefield Lilies, also known as the North Hybrids, were originally bred at The Scottish Horticultural Research Institute at Mylnefield, Invergowrie between 1966 and 1978. The Institute is now known as the Scottish Crop Research Institute. They were developed by Dr Christopher North, a renowned scientist previously responsible for breeding better strains of vegetables, including the Celtic cabbage (- the first F<sub>1</sub> hybrid Brassica produced in Britain).

The objective of the programme was to produce garden lily cultivars suited to the British, and especially the Scottish, climate. To begin with, varieties and species belonging to the Asiatic group were intercrossed in considerable numbers. This group was chosen because it is well-adapted for European conditions.

The hybridization was then followed by careful selection of offspring for their general garden worthiness. Plants were selected for their ‘vigour, freedom from disease, ability to stand without staking and unusual colours’. Initially four clones were released and named after Greek Gods—‘Minos’, ‘Orestes’, ‘Odysseus’ and ‘Phoebus’. These were closely followed by a further two—‘Achilles’ and ‘Pandora’. These hybrids were then multiplied vegetatively through ‘scaling’ of the bulbs. The next step involved the introduction of *L. lankongense* to the hybridization programme. This lily was chosen for its colour, a good, true pink, good scent and apparent resistance to botrytis. However, cross-pollination did not give rise to normal seed requiring propagation through embryo culture. The introduction of *L. lankongense* produced two particularly attractive hybrids. These were named ‘Ariadne’ and ‘Adonis’.

In 1973 Dr North won the coveted RHS Reginald Cory Memorial Cup for the breeding of Adonis. This is awarded to the raiser of the best new hardy

ornamental, resulting from a deliberate cross between different species.

Stage 3 of the programme involved 'Ariadne' and 'Adonis' being backcrossed with other Asiatic cultivars, again using embryo culture. This produced three vigorous hybrids named 'Eros' 'Theseus' and 'Pan'. These three hybrids turned out to be sterile so bulb scales were treated with colchicines; a known method of regaining fertility in wide species crosses.

The resulting plants had larger flowers and stronger stems and leaves. These plants also turned out to have 72 chromosomes proving that 'Theseus', 'Eros' and 'Pan' were triploids. This was of special interest, as the very few triploids known amongst lilies, in nature, are vigorous and often adaptable. The best example of this being the tiger lily, *Lilium lancifolium*.

Next came the North Lady series. These lilies all had downward facing flowers and were produced by backcrossing again to *Lilium lankongense*. Glasshouse temperatures were raised this time resulting in more seed capsules and more embryos. The ten clones chosen were named after the female members of Dr North's family including his wife, Marie.

### **Commercialisation**

In the introduction to his CD ROM The Mylnefield Lilies, Dr North expressed the following opinion:

*"No matter how good a plant variety is, it is unlikely to be a success unless it is well advertised and made available commercially".*

Although large scale commercial producers were approached, they were not particularly interested in the Mylnefield Lilies which were largely downward facing and not suitable for the lucrative cut flower market. As such, they have been sold by smaller nurseries resulting in distribution which has been erratic and small scale with frequent changes in ownership. This trend continues today.

### **Comments on general health and garden worthiness**

On the whole, interviewees agreed that the lilies were good growers and generally trouble free. However a few comments were made regarding the longevity of some of the earlier diploid Greek God cultivars such as 'Adonis' and 'Ariadne'. However, Judith Freeman, lily breeder and commercial grower, of the Lily Garden in Vancouver is a big fan of 'Ariadne' and has used it in the breeding of new cultivars. She considers it to be *'one of the best garden lilies of all time'*.

It was generally agreed, nonetheless, that the North Ladies, developed later in the programme, were somewhat more robust and longer lived than the Greek Gods.

### **Current cultivation and availability**

Members of the RHS Lily Group in Scotland and the north of England were surveyed. Of the 35 members who returned questionnaires only nine currently grow Mylnefield hybrids. This can be attributed in part, however, to some members stated preference for growing species lilies rather than hybrids.

On the whole, the Greek Gods were grown by fewer members than the North Ladies with 'Achilles' and 'Odysseus' not grown at all

Using editions of the RHS Plant Finder it seems that only three retail nurseries currently stock any of the lilies, with only a few cultivars being offered.

### **Conservation measures**

Conservation efforts to date have consisted mainly of a bulb scaling and sharing programme co-ordinated by Alan Mitchell of the RHS Lily Group and the establishment of a National Collection at Branklyn Garden in Perth.

Although the bulb scaling programme was at first small, it is steadily expanding and now includes members of the Hardy Plant Society as well as the Lily Group. Alan Mitchell has also set up a website to provide information and engage support in relation to the conservation of the lilies.

The National Collection at Branklyn provides a way of advertising the lilies within an attractive setting. Potted bulbs have also been for sale here over the past year. Steve McNamara, Head Gardener at Branklyn was awarded the RHS Lily Cup in 2007 in recognition for his efforts in establishing this National Collection.

### **Conclusions**

Research showed that the scarcity of Dr North's lilies seems mainly down to their status as 'garden lilies' and not 'cut flowers'. As such they were of little interest to large-scale producers and were never mass produced. Their production has always been modest and somewhat erratic through small nurseries, and their distribution a little patchy. They are undoubtedly garden worthy and disease-resistant but have never been widely available.

### **Recommendations**

As part of my project I was asked to comment on the conservation efforts to date and to make recommendations for future action. I must admit to being rather reluctant to do so given what I saw to be the tremendous efforts made by those involved. Under duress, I came up with the following.

Although successful, I concluded that the current conservation efforts of bulb scaling and distribution and the establishment of a National Collection at Branklyn are alone perhaps unlikely to bring the lilies to the attention of the

wider gardening public. As such I made the following recommendations:

- extending the current bulb scaling project to other horticultural groups
- raising the profile of the hybrids further by establishing other National Collections both North and south of the border—for example at Wisley and at SCRI who both have historic links to the hybrids
- expanding the marketing of the hybrids to other NTS plant centres and gardens—promoting them as a truly Scottish product

Finally, I recommended that it may be of great benefit if future commercial production was taken over by a few well-established nurseries with proven track records in the marketing and growing of ‘specialist’ plants. I realize that this is more easily said than done.

### **On reflection..**

I really enjoyed working on this project mostly due to the people I met on my journey who were so interesting, dedicated and inspirational and who could not have been more helpful. My project was limited to 7000 words, not really adequate to do the subject justice, and certainly not enough to include all of information made available to me. My most arduous task was deciding what I must leave out. I can only hope that the final version goes some way to helping to raise awareness of these lilies, some of which I now grow and cherish in my own garden. I wish all involved in the conservation efforts good luck for the future and urge them to continue to promote and increase wonderful Mylnefield lilies.

*(Ed. It is heartening to report that the Scottish Crop Research Institute, SCRI, now has an impressive collection of North hybrids, which are on public display at Mylnefield.)*

★ ★ ★



# New interest in *Lilium iridollae*

*The need to relocate a small stand of L. iridollae led to “new interest” in one of the rarest and most site-specific of American species lilies, as Marianne Casey recounts in this article.*



*Lilium iridollae.*

A request for information came through the NALS website in August 2008 and caused a flurry of excitement among Species Lily Preservation Group (SLPG) members and lily enthusiasts. The request involved the need for information on *L. iridollae*, one of the rarest and most site-specific lilies in the genus. Biologist Michael L. Jenkins of the Florida Division of Forestry’s Plant Conservation Program contacted several experts for information about the species in order to best manage a relocation of a small stand of *L. iridollae*. During planning stages of a gas line extension project in a Florida Panhandle county, several stems were discovered in the path of the Right-of-Way (ROW) extension. Michael’s department responds to statewide conservation and ecology concerns where rare, endangered, or threatened plants are involved, and the effort to save the plants is underway. While compiling information for Michael, I realized just how little is written about *L. iridollae*, and also learned that few members of our lily societies have ever seen it in the field—in bloom or otherwise. As the conservation project moves forward, we will have an opportunity to document more about this lily and to obtain seeds to assist in strengthening its population.

## **The ‘Pot of Gold’ lily**

In 1940, Mary Henry discovered *L. iridollae* in its habitat, recorded the initial information and named the lily in reference to a “pot of gold at the end of the rainbow”. Her brief but important findings were published in *Bartonia* in 1946, the journal of the Philadelphia Botanical Club, and her findings are cited in the FNA (Floras of North America) Online database.<sup>1</sup> Mary Henry also authored a less formal summary for the 1949 NALS Lily Yearbook which included her experience growing *L. iridollae* from seed in Gladwyn, Pennsylvania. A synopsis was published in the SLPG bulletin’s Spring 2006 issue, where little new information was added. While a few books written by *Lilium* experts and growers include an acknowledgement or a general description of the species, most have no mention of *L. iridollae*. Some references, such as the USDA Plant database,<sup>2</sup> include the

nickname “Panhandle Lily” based on its precise location in the western Florida counties. Not all taxonomists agree it is a distinct species. Those of us with interest or involvement with the relocation project have been presented with an opportunity to clarify doubts about this lily.

Much information on *L. iridollae* was provided by Mark Skinner and Bruce Sorrie of the National Plant Data Center in their report on *L. pyrophilum*, published in *The Species Lily*, the SLPG’s bulletin. *L. iridollae* is considered one of five known *Lilium* species native to specific sites in the United States’ southeast region, the other four species being *L. pyrophilum*, *L. michauxii*, *L. catesbaei*, and *L. grayi*. Three other species, *L. superbum*, *L. canadense*, and *L. philadelphicum*, are native to regions east of the Rocky Mountains where populations are reported to persist in the southeast region. This region encompasses areas in Alabama, Georgia, Florida, South Carolina, North Carolina and Southern Virginia, and in most cases, the occurrence of native populations of any of these species is extremely site specific. *Lilium iridollae* is perhaps the most demanding of specific conditions, hence one reason this lily has been elusive to many enthusiasts. In general, the southeastern region of the United States is not considered “lily growing country” given its warm winter temperatures and high humidity which are not conducive to the persistence of garden lilies.

The bloom of *L. iridollae* has a fully recurving form, a deep, golden yellow color with more of a buff hue than orange, and purplish-brown spots. Most descriptions state a single bloom is typical, but some accounts report up to eight blooms, and that the flower is lightly scented. Mary Henry identified its pollinators, the larger swallowtail butterflies within the species’ range. Its leaves are sparse in the top two thirds of the plant, with whorls of lanceolate leaves toward the bottom third.

Ed McRae describes the bulbs as small and white forming at the end of stolons.<sup>3</sup> All of these characteristics should be surveyed and confirmed in future observations, and where necessary, more accurately described to distinguish *L. iridollae* from other species.

The newly discovered small stand consists of about six or seven stems, located as expected in a sandy, peatbog site. One of Michael’s main questions involved the bulb type, i.e., what to expect when the soil was moved for the relocation and how to plan the amount of soil space to include around the stems to ensure safety of the fragile bulbs.

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<sup>1</sup> Flora of North America (FNA), www.eFloras.org Volume 26:17.

[http://www.efloras.org/florataxon.aspx?flora\\_id=1&taxon\\_id=242101733](http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242101733)

<sup>2</sup> United States Department of Agriculture, Natural Resources Conservation Service Plants Database: <http://plants.usda.gov/java/profile?symbol=LIIR>

<sup>3</sup> McRae, Edward Austin. Lilies: A Guide to Growers Collectors. 1998. Pg. 141.



*Lilium iridollae* photographed in the Panhandle by Michael L. Jenkins, of the Florida Department of Forestry.

*Lilium iridollae* may differ from most southeastern species by its tolerance to wet conditions, and as suggested by Jim McKenney via email correspondence, the bulb may actually be submerged in water for an extended period of time. Jim once grew *L. iridollae* and describes its requirements as “wet, acidic soil that would rot any other lily quickly,” and mentions *L. catesbaei* also prefers similar soil condition. “In nature both are almost semi-aquatic in the sense that during at least part of the year the bulbs might be submerged.”

Both Ed McRae and Carl Feldmaier indicate *L. iridollae*'s bulb type is stoloniferous. Feldmaier's description of the stoloniferous structure suggests what *L. iridollae* stolons may appear like under the soil surface: “one or two underground stolons [growing] from a point where the stem leaves the bulb. They are finger-like and fleshy, forming, after  $\frac{3}{4}$  to  $1\frac{1}{2}$  inches growth, new bulbs with scales. In the course of only a few years a whole network of stolons, all terminating in bulbs, is built up.”<sup>4</sup> It may not be a safe assumption that such an extensive network of bulbiferous stolons exists for this particular stand of *L. iridollae*, however, without knowing how long the stand has been situated.

During a visit to the stand in late summer 2008, Michael took a soil sample for analysis. As one would expect, the soil's texture classification is “sand,” specifically: 96.318% sand, 0.178% silt, and 3.504% clay.<sup>5</sup>



*Lilium iridollae*, a.k.a. the 'Pot of Gold' lily, in its natural habitat.

### **Finding a 'Pot of Gold' and relocating it**

Michael is a Plant Conservation Biologist at the Florida Department of Forestry's Endangered and Threatened Plant Conservation Program. The program's goals are "to restore and maintain existing populations of listed plants on public land and on private lands managed for conservation purposes. Previous or ongoing projects address demography, monitoring, reintroduction, germination, pollination, and other aspects of population ecology."<sup>6</sup> The *L. iridollae* project will be Michael's first experience working extensively with the Genus *Lilium*; however, he is familiar with relocation efforts of many other rare and fragile plants. His current tasks include saving forty *Platanthera* orchids (*ciliaris*, *cristata*, *integra*) and *Sarracenia rubra* and *leucophylla*. During initial planning of the *L. iridollae* relocation, Michael consulted with Mark Skinner (who studied *L. pyrophilum*) for methods used in handling fragile or rare bulbs to determine a suitable plan for the *L. iridollae* stand.

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<sup>4</sup> Feldmaier, Carl. Lilies. 1970. Pg. 39.

<sup>5</sup> Quality Analysis Laboratories. 403 E. 11th Street, Panama City, Florida 32401.  
<http://www.qal.us>

<sup>6</sup> Florida Department of Forestry's Endangered and Threatened Plant Conservation Program: [http://www.fldof.com/forest\\_management/plant\\_conservation\\_index.html](http://www.fldof.com/forest_management/plant_conservation_index.html)

The 2008 season's effort involved collecting and sowing seed in an effort to increase the population. The actual ROW extension plan is slated for 2010, but with the OOW (out of way) site already selected, seeds could be started last fall. A conflict exists on the germination type of *L. iridollae* seed, but its closest relatives are hypogeal, often immediate hypogeal. This is another yet another characteristic which needs to be confirmed. Depending on the quantity of seed available, seed may be offered to interested growers. Michael is sensitive to keeping locations of populations private, however, and he and others in his department will not disclose locations of the stems.

### **Threats to *Lilium iridollae***

In the past, primary threats to the species were noted as open grazing and loss of populations to development. Today, however, Michael believes the main threat is a combination of factors that affect the characteristics of the lilies' preferred site. "Factors of drought, the drawdown of the water table and springs, and fire suppression give a hard punch to species," Michael observed in our conversation, emphasizing that *L. iridollae* definitely needs fire as a maintenance factor. "The species is gone or absent from fire suppressed areas and can only be found where either cows or fire keep the wetland shrubs down." In the 2005 report on *L. pyrophilum*, Mark Skinner and Bruce Sorrie likewise stated a primary factor in sustaining that species' populations is a fire requirement, and they noted that much research was needed to determine the exact role and importance of the fire factor.

Grazing by feral hogs, deer, and cattle is not denied as a threat, however. In one aspect grazing serves as temporary assistance, because plant life surrounding the stem is thinned and removed providing more room for the species lily. This assistance is indeed temporary, as sooner or later the stem itself is consumed. In areas where hunting is not allowed, grazing becomes detrimental at an exponential rate: the higher the population of deer, the higher the rate of consumption.

For this species, the need for fire and water stability is paramount to naturally occurring site requirements, and is aptly summarized by the United States Botanic Garden on their web page for *L. iridollae*. "The balance of the habitat of this endangered plant is dependant on periodic, naturally-occurring fires caused by lightning strikes that reduce competition from other plants and release nutrients and organic matter from burned peat moss and leaves into the acidic, nutrient-poor soil. Its sensitivity to changes in drainage patterns and water quality make *Lilium iridollae* particularly vulnerable to disturbances in its ecosystem such as

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<sup>7</sup> United States Botanic Garden:  
<http://www.usbg.gov/plant-collections/conservation/Lilium-iridollae.cfm> 2008.

overgrazing by livestock and urban development in nearby areas.”<sup>7</sup>

The USDA Natural Resources Conservation Service lists *L. iridollae* as Endangered under Florida state jurisdiction, and as Threatened status in North Carolina. At this time, no federal lists include *L. iridollae* as Endangered or having Threatened status.

While visiting the *L. iridollae* stand to get the soil sample and check for seeds in November 2008, Michael found another stand of fifteen or so stems nearby, and wrote that this stand too would be subject to protective measures.

### **New information, new interests**

Michael's department participates in the Flora of North America (FNA) project, and he will provide the FNA administrators data as it is encountered in the field so the FNA database may be updated accordingly. New or updated research would be enlightening, particularly on the existing populations of this lily compared to the approximate twenty locations Mary Henry reported in the 1940s.

The small bits of information on *L. iridollae* lead only to other questions: to what level must the soil characteristics be emulated in order for the bulbs to persist in cultivation? Just how much water can *L. iridollae* bulbs withstand, or how low a winter conditions. Does foliage appear above ground throughout the year as noted in some reports? Is it prone to virus and what is its tolerance to *Fusarium* rot? Michael also monitors stands of *L. catesbaei* in the area, which appear distinctly different in form yet requires similar, though slightly drier growing conditions. Their presence invites a study of two or more of the southeastern region's *Lilium* species, and closer look at their origins.

During our correspondence, the availability of NALS research trust funds was mentioned in respect to making further research possible, perhaps on the subject of the fire factor as previously noted, or confirming other traits of the species that would benefit our collective knowledge of the southeastern region *Lilium* species.

From the hybridizing perspective, what could be gained from using *L. iridollae* as a parent? Of course the challenge of finding species that will successfully hybridize with it would need to be met first, but then... would it be possible to obtain traits such as late-season bloom, persistence in wet soil, and short vernalization time? What if *L. iridollae* can be successfully hybridized and pass on the trait of heat tolerance, thereby providing a new lily hybrid suitable to hot weather zones? Such a result would be a pot of gold at the end of a hybridizer's rainbow.

### **Footnote**

This article was first published in the Winter/Spring 2009 Mid-Atlantic Lily Society (MLS) Newsletter and is reprinted here by kind permission of the MLS.



*Lilium 'First Crown'.*

## Lilies at Eden

***Helen Lannon**, who is employed as a Skilled Horticulturist at the Eden Project, provides a fascinating insight into growing lilies among the Biomes of this unique garden.*

The Eden Project, which opened in March 2001, is situated at Bodelva near St Austell in mid Cornwall. The site was previously a working china clay pit and as such there was no soil. 83,000 tonnes of soil was manufactured using recycled waste: - sand from local china clay works, clay and organic matter in the form of composted bark. The soil was mixed by JCB in a nearby pit and the final ingredient was an inoculation of worms.

I have worked at Eden since 2002 as a skilled horticulturist within the Green Team, helping to look after the outdoor planting in the pit.

At the centre of the pit is an exhibit called 'Flowers in the making'. Different genera of popular garden plants are grown, showing the origins, breeding and selection that have resulted in the plants we grow today. Plants here include the sweet pea, hemerocallis, dahlia, hardy geranium, salvia and delphinium.

The lily is a deservedly popular flower and was an obvious choice to grow in the exhibit. In 2006 I had the enjoyable job of choosing which lilies to include

and from the enormous number of possibilities, I first settled on the Asiatic Division. These lilies are generally easy to grow and would be familiar to many of our visitors. I included *L. lancifolium*, *L. davidii* and *L. leichtlinii* as species involved. 'Fire King' represented one of the early cultivars with the Citronella Group. 'Nove Cento', 'Gran Cru', 'Elodie' and 'Lollypop' showed the variation in habit and range of colour. The Pixie cultivars were included as examples of dwarf lilies suited to patio or pot culture.

Whilst researching which Asiatic lilies to include, I found Chris North's lilies where grouped within the Asiatics. He had bred them to be good garden worthy plants, strong stemmed and disease resistant. This made them good candidates if I could source them. (I had received bulbs of 'Eros', 'Rosemary', 'Bronwen' and 'Angela' from the RHS Lily Society to propagate and distribute but at this time, they were too small to include at Eden.) I sourced a number of cultivars: 'Eros', 'Ariadne', 'Minos', 'Orestes', 'Bronwen' and 'Rosemary', as small bulbs, not yet flowering size. Once they flowered they proved to be 'Eros', 'Orestes', 'Rosemary' and 'Bronwen'. Disappointing not to have all six but they were healthy and have since increased well.

Hybrids between the Asiatic and Longiflorum groups chosen for the exhibit were impressive, vigorous plants with clear colours. An Asiatic Oriental hybrid, 'First Crown', proved to be a very good lily with strong stems, warm orange and red flowers and an attractive perfume.

It was frustrating to be unable to get hold of early cultivars lost to cultivation due to disease or lack of commercial value. 'Tweedledum' and 'Tweedledee' were two I would particularly like to have found because they were bred locally. If any members of the RHS Lily Society know where they might be sourced, I'd be delighted to hear from them.

The lilies were potted up in a mix of loam, peat free compost and sand, the smaller bulbs in groups in 10 litre pots and the larger bulbs individually in 3 litre deep pots. Plants were placed inside containers amongst hardy geraniums. This made it possible to display the plants whilst in flower but remove them as soon as they went over.

During June and July the lilies flowered well and were very popular with the visitors. After flowering, the plants were fed with a high potash liquid feed.

The following year it was decided to extend the flowering season by growing members of the Oriental group. *L. auratum*, *L. speciosum* and *L. henryi* were included as parent species then a range of cultivars of different colour and height.

The Oriental cultivars were potted in peat free compost. This has a relatively low pH which suits this group and also made the pots lighter, much easier to handle. The same compost is now used for all the lilies and they are potted 5 to a 20 litre pots.





**Above left, *L. lancifolium*. Top right, *L. leichtlinii*, yellow form.  
Above right, *L. 'Lollypop'*.**

The lilies from the two divisions flowered from June to August and were enjoyed by the visitors who appreciated the colour and perfume of the display.

We haven't escaped problem free. In a dry season we've had powdery mildew. In a wet season the lilies have suffered from botrytis. During 2008, the Oriental cultivars grew exceptionally tall. Also in 2008 the dreaded lily beetle was spotted on the foliage for the first time. The 3 adult beetles were captured and despatched but the chances are we could see more this year.

Other lilies growing at Eden are: *L. longiflorum* in a white border; *L. leichtlinii* with its attractive pendant buds (which always remind me of glowing light bulbs) planted amongst *Helenium 'Moerheim Beauty'* and *Stipa arundinacia (Anemanthebe lessoniana)*; *L. lancifolium* and *L. pardalinum* planted in mixed borders amongst purple-foliaged plants and yellow or orange flowering plants and *L. henryi* and 'Black Beauty' provide contrast and complimentary colour in a border of mainly blue plants

In the future, it will be interesting to see which lilies thrive, either growing in pots or in the challenging conditions of the manufactured soil. Fingers crossed we don't have an explosion in the lily beetle population. Our aim is to continue to grow these attractive plants for the public to enjoy and perhaps some will be inspired to grow lilies at home.



## ***Trillium chloropetalum***

*In this article **Isa Hall** shares her knowledge of and admiration for a very beautiful trillium.*

*Trillium chloropetalum*, whose natural home is around San Francisco Bay, was an immigrant here in this garden before I married into it in 1973. Its identity has sometimes been questioned, for there is considerable divergence of opinion among taxonomists about this species. But my husband had the original three seedlings from the RBG Edinburgh, and for me that is warrant enough. In any case I am not sure that it matters to me what this or that taxonomist might choose to call it—this is our *Trillium chloropetalum* (var. *giganteum*).

Trilliums have been allocated to the lily family, but there is talk of their being given a family of their own, Trilliaceae. Their name comes from their having three of everything—or almost everything: three leaves, three sepals, three petals and three stigmas, but (just to be awkward) six anthers. Some trilliums have their flowers subtended singly, each on a short petiole at the top of the sturdy stem, but *Trillium chloropetalum* belongs to the group of sessile trilliums, whose flowers, having no petioles, do not face outwards, staring the observer in the face, but sit straight up on a sort of salver of their three broadly-obovate leaves,



*Trillium chloropetalum* bed.

nose in the air, ignoring their admirers with stiff aristocratic indifference. The leaves are usually mottled with spots or patches of a dark brownish green, and where this mottling occurs strongly the result is very attractive; the long, narrow, upright petals are very dark blood-red, most striking, not to say startling, when you catch sight of them with the westerling sun shining through them.

The original three clumps here eventually merged into a solid mass which has for thirty-odd years been slowly expanding and today they form the upper edge of the solid mass, which is slowly taking over the bed in which it was planted all those years ago; it has surrounded and subdued what was a young *Enkianthus* seedling planted at what then seemed a safe distance. This is now a wizened and prematurely aged small shrub, and the trillium has gone on to swallow up various clumps of *Leucojum vernalis*, *Notobolus bulbiferus*, and *Galanthus* 'Warham Variety'. I am trying to harden my heart in preparation for taking a spade to it before it reaches the part of the bed where *Erythronium revolutum* is naturalising. It is also itself infested with bindweed, which it is virtually impossible to eradicate from under the tight mass of trillium rhizomes. I spend a fair bit of time annually pulling off the bindweed stems but have always shrunk from digging up the trillium to make a good job of it. (Bindweed is almost impossible to eradicate from anywhere, and is one of those intruders

where the most practical advice is to sell to a dedicated concrete lover, and move house.)

There are clumps of *Trillium chloropetalum* here and there throughout the garden. It was my practice, years ago, when weeding, to take out a deep-rooted weed like a dock or dandelion and replace it with a *Cyclamen hederifolium*, a pot of *Erythronium* seedlings, or a *Trillium chloropetalum*, so that the trilliums have established small colonies here and there. They self-sow prolifically, though less so within range of our yearly floods, which presumably wash away the loosely-lying, half-rotted, fat seed pods, that spill out the seeds where they lie. Ants are said to carry them away, but I have no evidence of this. (Tell it not in Gath, but in its decline and dissolution into dormancy, *Trillium chloropetalum* also dissolves into slovenliness.) I have tried to grow *Trillium chloropetalum* from seed in pots but it is hardly worth the trouble as there are always patches of seedlings from which one can dig up whatever is wanted. I gather that the seed takes two years to germinate, but once the process has got going it is an annual event. The seed germinates even in the bark of the half-rotted logs that edge the bed and in the grass of the path beyond. The first manifestation of the appearance of a young plant is a single cotyledon, oval and not half an inch long, which enlarges annually for a year or two and then becomes trifoliate. The first flower appears at about five to seven years old. It sounds very slow—and indeed is so—but again, once the process is fully established there is an annual increase. All our weeding is done by hand—insofar as it is done at all. From time to time the bed has been treated to an autumn mulch of garden compost, but on the whole it is satisfied with the fallen leaves of the huge ash tree which dominates the lower garden.

I have suggested, if not actually stated, that *Trillium chloropetalum* is a sturdy plant, and its latest adventure here confirms its toughness. In September 2008 we had our worst flood ever, the main *Trillium* bed being submerged to a depth of some 1.2 metres of murderous torrent, and some of the smaller, outlying patches lower down the slope to up to 2.4 metres at least. The *Trillium roseum* that I paid a fortune for two years ago has gone without trace, and so has my beloved little *Trillium rivale*, but in the spring the newly appearing *Trillium chloropetalum* seemed to have suffered no disarrangement. “Flood?” it said. “What flood?” and with its aristocratic nose in the air ignored the mess of uprooted trees, tangled, rubbish-stuffed shrubs and flattened geraniums and schizostylis leaves with which we were still struggling, with no more than perhaps a touch of disdain for such untidy disarray.



# A love affair

*I first met **Charlie Kroell**, the author of this article, at the International Lily Conference, in 2004, and then again when we “chased” lilies together in California, in 2007, and the only thing that impresses more than the beauty of his hybrids is his sense of humour and kindness as a person.*

The Mitchell o’ Hallfield asked if I might pen a few words concerning the background of certain seedling hybrid lilies with which I have been especially enamored in recent years. To do so adequately, I feel, will require a bit of historical perspective, developed through several flashbacks to “those thrilling days of yesteryear,” now long past. Further, and in the way of a caveat, I will note that over a somewhat protracted period of time, related writings have appeared in various publishing venues within the lily community; and what follows will have been supplemented by chosen excerpts from the latter, as they relate specifically to the content of this article.

My continuing love affair with lilies began some four decades ago. I first became aware of the genus in more than a casual way during the mid to late 1960s. As I settled into a happily married life with two young daughters, a latent interest in floral horticulture began to stir; and with each new gardening season, the yard of our small home in Royal Oak, Michigan displayed less lawn but more flowers and shrubs. A chance event occurred one autumn, however, when our little garden was being readied for winter that was to launch the transformation of a simple interest and seasonal hobby into an addictive passion and a year round, lifelong avocation. My good wife, Marijean, returned from a shopping trip with a bag of mixed lily bulbs that she had found on sale at a local garden center. At this time I was aware of some three kinds of lily...“Easter”, “Tiger” and “Madonna”, but that was about it; and we had never actually grown any of these. I had not the slightest idea about the countless varieties of both species and hybrids even then available let alone the likes of what were yet to come as the years would pass.

These new bulbs were welcomed, however, and planted in a bed especially prepared for them. The following spring, when the “asparagus spear” shoots began to emerge, they brought with them a fascination, which, as the stems lengthened and the inflorescences developed, swelled into excitement and finally became something bordering on disbelief...joyous disbelief...when the first huge fragrant flowers opened. They were, of course, trumpet lilies. ‘Black Dragon’, that wonderful strain of *L. leucanthum* var. *centifolium*, was among them. Other specific varieties are not remembered, except that one stood out from all the others,



***Above***, Flower: Purple Fleck type: CK03-PF1.  
***Below***, Flower: Purple Fleck type: CK07-PF04.





*Above*, Flower: Henryi Type: 'Betty Sturley'.

*Below*, Flower: Henryi Type: CK06-HT13.



later to be identified as *L. pardalinum* var. *giganteum* (a.k.a. *L. barrisianum*, 'Sunset Lily', 'Red Giant'). Here then was the first hint, and a dramatic hint, concerning the wealth of diversity contained within this genus. At about the same time, a second event occurred which, coupled with the first flowering of the new bulbs, represented a kind of Epiphany-like experience...the first of three that were to mark my long, fascinating and wonderfully rewarding infatuation with lilies that was to follow (more of the others as the story unfolds). This was the discovery and purchase of a thin pink booklet that provided an excellent introduction to the genus *Lilium* and did so in an irresistibly persuasive manner: *Let's Grow Lilies* (1964-2003), that delightful primer prepared and so charmingly illustrated by Virginia Howie, published by the North American Lily Society.

It was also in these early years that a personal philosophy of flower gardening emerged, which I have retained to this day: that it is, by all means, desirable to have wide ranging interests and to grow and enjoy a broad spectrum of the myriad botanical treasures which Nature has made available to us. However, at the same time I believe that the greatest joys of this splendid avocation can be derived by choosing one genus of plants to love more than all the others...to study in greater depth and to labor over with greater effort and enthusiasm. Obviously I have chosen *Lilium*.

But I digress already and must return to the tale at hand. The second "revelation" which was to help set the stage for, in later years, a chosen direction and focus in hybridizing, occurred when I first learned of a yellow flowered variant of *L. henryi* in the early/mid 1970s. A knowledgeable and enthusiastic young member of our Michigan Regional Lily Society, MRLS, had fallen heir to a colony of lilies, identified as *L. henryi* var. *citrinum*, which had been long established in the garden of an old gentleman near Ypsilanti, MI, who had recently passed away. He generously offered bulbs to interested MRLS members; and I remember accepting two or three of them with, primarily, a sense of curiosity. At that time lilies had been a serious hobby for only a few years, and my primary interest was in working with Asiatics.

I do not have a distinct recollection of the first flowering of these gift bulbs; but flower they did and were in every respect, save that of colour, classic *L. henryi*: heavily papillose, strongly reflexed flowers with chocolate flecking and a bold, fully revealed six-rayed, deep-green nectary star; dark green foliage with dimorphic leaves; a tall, long-branching inflorescence when mature and well grown; and, of course, the weak arching (or consummately graceful, if you please) stem and pedicels. The flower colour, however, was a clear light yellow with *no trace of orange*. I had no question then, and but little today (of which more to come) that this clone is indeed a yellow variant of that most fascinating and invaluable species, *L. henryi*. The clonal stock of these gift bulbs has remained



with me since that time and has proven to be virtually indestructible. Up until about a dozen or so years ago I kept and grew it rather as a novelty, and survival in the face of gross neglect was pretty much its own responsibility. This included a quiescent period for all my lilies, associated with our relocation to Troy in 1979. The 1987 MRLS show was one of those very late ones where everybody is uptight about having any lilies whatsoever to display. Two stems of my yellow henryi were looking pretty good, however...one taller and more floriferous than the other. On the morning of the show a single flower of the less impressive stem had opened; and I decided to cut it, to help fill the display tables while also thinking that this unusual lily might provide, for some at least, a subject of special interest. I was not aware of anyone else then still growing this clone that had been distributed some 15 years earlier (referred to hereafter as the “Ypsilanti clone”). There was more than casual interest shown...to the extent that I found my own interest stimulated and myself inspired to seek a better understanding of this singular lily that had so faithfully endured for me but concerning the history of which I knew virtually nothing. Since then I have been involved in a yet unending personal quest to unravel its mysteries (Kroell, 1991)<sup>1</sup>.

It was at about this time also that my third “awakening” occurred, when I became aware of a most curious and stunning hybrid, also related to *L. henryi*, which would, together with the yellow *henryi*, reshape my hybridizing goals as well as redefine what “favourite” meant to me. This was (and remains) to my eye a breathtakingly unique and exotic Aurelian hybrid of the legendary Leslie Woodriff: his ‘Black Heart White’ (unregistered at the time), having snow white flowers of bowl/sunburst form with orange flares surrounding virtually jet black nectaries. It is described in the RHS International Lily Register as having resulted from the pre-1960 cross ‘T.A. Havemeyer’ x ‘White Henry’, i.e.:

*(L. sulphureum x L. henryi) x (L. henryi x L. leucanthum var. centifolium)*, where *L. henryi* is represented in both of the parents. This fact alone is suggestive that the black nectaries may well derive from the *henryi* gene set. The black has been said to result from an overlay of red pigment on the normally green nectary furrows (Judith Freeman, personal communication). Of the three species involved in this cross, only *L. henryi* typically displays “red” pigmentation...in its flecking and papillae. Actually ‘Black Heart White’ is heavily pigmented in other respects as well, the bulb being as dark, if not more so, than that of any other lily I’ve ever seen; and its newly emerging shoot is a deep maroon. The flower

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<sup>1</sup> Our esteemed but puckish editor, Alan Mitchell, relentlessly accuses me of claiming that *any and all* of the various yellow (or primarily yellow) colored lilies of *henryi*-like form that have been touted as *L. henryi* var. *citrinum* are in fact hybrids. Not so! However, *bis* multiple attempts to procure photographic confirmation of a true yellow variant of *L. henryi* growing in the wilds of China have as yet been unsuccessful!

is positively striking, although the tepals are of but medium width. For me it has proven to be a very durable lily, doing well in either container or garden culture but has never been particularly floriferous, 11 being its highest bud count. Nor has a bulb ever divided naturally here, although scaling has been quite successful. On the other hand, John Lykkegaard, Haslev, Denmark, growing BHW only in a pot, has had a stem bear 13 flowers; and his bulb has split at least once. For each of us our best stems have carried one set of tertiary buds. What might it have looked like and how robustly might it have grown when it first came upon the scene? This is a clone which has been propagated, although not extensively, for over 50 years. I have seen no obvious signs of virus but assume that it must be asymptotically infected. It would be most interesting to perform viral assays on several bulbs growing in different locations. Over all these years I have registered but eight seedlings, five of which are still extant. Three were “black hearts” and two of these remain: ‘Black Opal’ and ‘Susan Elizabeth’ (named in honor of our granddaughter).

We all have personal tastes...likes and dislikes, and thus it seems only natural that (at least for many of us) in making crosses, parents will be selected primarily upon what is aesthetically pleasing to our eye in the way of flower characteristics and plant habit. Other important qualities (e.g., disease resistance, frost tolerance) may often be secondary considerations.

I have been growing and hybridizing lilies for some four decades now and over the years have had the good fortune to be gifted with breeding material that has contributed toward lines of seedlings that, to my eye, have been most pleasing. Division VI early-on became my favorite (Kroell, 1992), with lines descending from Black Heart White and the yellow *henryi* being of greatest interest. For quite some time, dark nectaries (black, “mahogany,” brownish, solid or “brushed”) were the primary objective. About three to four years ago, however, a trio of fascinating, large bowl-shaped seedlings...white with conspicuous purple flecking, or pencilling, and fine picotee edging on the petals, *mysteriously appeared* (quite obviously related and thus nicknamed the “PF Sisters”); and these stimulated interest in working toward other goals as well. *Mysteriously appeared* has been italicized because, for the life of me, I can offer nothing to adequately explain their origin. There is, though, a short story...for me somewhat frustrating/embarrassing and possibly for others a bit humorous (in a Schadenfreude sense) all melded together...that might be of interest. Over the years a chronic annual spring problem has been to find space in the garden for each new crop of seedlings. It was probably around Y2K or 2001 that, for want of a truly good location, I chose to plant the entire lot in a site knowingly predestined for poor performance...beneath a large maple tree having thirsty surface roots and shrouding the bed with a menacing canopy of shade. The

seedlings of course did *not* fair well. Languishing under oppressive conditions, a few struggled to achieve anthesis; but these were the exceptions, and of those that did bloom none was anything to write home about. Eventually, one autumn, in a fit of discontent, I dug the entire bed and gave the smallish bulbs away...all of them, *or so I thought*. Enough had been enough. A couple or so years later (and the time now elapsed from first planting begs for an explanation) three blind stems emerged near what had been one corner of the former ill fated bed. The following season the first of these bore a single flower...a beguiling thing, the likes of which I had never seen before and, to my eye, very pleasing to behold: a 16cm white bowl, copiously adorned with purple pencilling in the throat and a purple picotee edge margining the petals. And the scent (always for me a much coveted quality) was reminiscent of lily-of-the-valley. The other two stems eventually flowered as well; but the “firstborn” has been favoured and used most in hybridizing. A lingering question is “What other little gems might possibly have been given away, unknowingly, a few years earlier?” And to add insult to injury, so to say, I cannot claim unequivocally, that these purple fleck sisters are the result of my own hybridizing work. If I recall correctly, there may have been a few plantlets from other seed sources mixed in with the original lot. Be that as it may, whether “fathered” by myself or adopted as orphans, they are loved equally well, and I am more than happy to have found this new mini gene pool for use in further work.

Then, as recently as three seasons ago, another group of seedlings seemed to stand up in unison and call out, “Hey, look at us! See what you’ve been missing!” I have long considered *L. henryi*, from an overall perspective, to be probably the most important member of the genus (Kroell 2001). For me the floral architecture of this species is addictively attractive: fully recurved/overlapping tepals resulting in a handsome globular form, combined with long, gracefully arched stamens thrusting forward around an equally long, slender style capped with a diminutive stigma. I also have a great fondness for papillae, with which *henryi* is richly endowed.

But for whatever reason, it was not until recently that the thought occurred of including a focus upon these appealing phenotypical *henryi* floral attributes in any further breeding work I might do. In retrospect, there was good reason to have adopted this mindset as far back as a decade ago, when the seedling appeared that I eventually registered and named in admiration of a good friend, Betty Sturley, a local world class gardener and artist. I believe it to have resulted from a cross involving the ‘Ypsilanti’ clone of *L. henryi citrinum*, and another gift seedling, from David Brown of Portland, Oregon (which he had originally assumed to also be a yellow clone of *henryi* but subsequently came to be seen as a hybrid and registered as ‘Nikki’). “Betty” had all of the aforesaid *henryi* qualities



***Above***, Flower: Black Heart type: CK07-BH04.  
***Below***, Flower: Black Heart type: CK08-BH05.



combined with a white base colour, conjuring up thoughts and dreams of the late Josephine Henry's short lived "truly stunning new lily" described and pictured in the 1988 NALS Yearbook. I have more than once pointed to this as a personal "Holy Grail" of *Lilium* breeding: a pure white form of *L. henryi*, (save possibly for painted papillae and green nectaries, but devoid of colour in the throat) or at least such a hybrid otherwise indistinguishable from the species. Still, I did not then turn my attention and energies fully in this direction. But, once again good fortune struck. A few years ago Anton Mego of Slovakia (an exemplary gentleman and outstanding hybridizer, *especially* within Div. VI) sent me a number of his finest seedlings having a strong *henryi* influence. Most certainly some of the new "pretty faces" that have appeared in the garden of late (christened my *henryi* type/HT line), reflect genetic contributions from his work.

How many more seasons of hybridizing lie ahead for me cannot be known. At age 75 and counting, the hour glass' upper bulb drains inexorably toward depletion. However, it is safe to say that in those years remaining my efforts will continue to focus upon Div. VI with its black hearts, purple flecks and bewitching attributes of *L. henryi*.

My late close friend and lily breeding colleague, William T. (Bill) Craig of Battle Creek, Michigan, held that "as hybridizers we all stand upon one another's shoulders." So *very* true this is! For all those seedlings that have first flowered in my garden and have been the source of so much pleasure over so many seasons, I am deeply indebted to the generosity and creativity of so many others. And, finally, I will reiterate here, for something like the umpteenth time, that across all these years of my undying love affair with lilies, the truly greatest rewards of all have been those deriving from the numerous treasured friendships that have been forged along the way.

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# My experience of growing *Fritillaria* in a garden near Moscow

*By Konstantin Aleksandrov. Translated by John Page*

I began to take a great interest in growing plants about 25 years ago. My parents used to own a plot some 40 kilometres to the north-west of Moscow where they grew flowers, but sadly the range was very limited. The conditions were not particularly favourable. The garden was in a low-lying spot, open to the north-west, with a fairly dense wood to the south-east. As a result, in the spring and autumn there were frequent frosts and in winter the temperature was often 5 degrees Celsius below that in Moscow. As I said earlier, we were very much involved with flowers, but it was difficult to get hold of anything really new and interesting. For the most part, you acquired your plants from fellow enthusiasts. Often they themselves did not know what they were. In the early days I was not all that interested in plants, I simply helped my parents, but gradually I developed an interest in new and unusual things, and so it came about that I got hooked on bulbs. Narcissus were my first passion. I collected about 70 different ones, covering virtually every section. Next, I became mad on hyacinths and after that erythroniums and corydalis. *Erythronium sibiricum* and *Corydalis bracteata* were everywhere in the garden. Finally, it was the turn of *Fritillaria*. Up to 24 species of *Fritillaria* grew in the territory of the former Soviet Union, two of them in the area around Moscow even, as I later realised. *Fritillaria imperialis* was my first species. Actually, it bore the name of a lily when I first grew it. It did not flower the following year and the year after that it was killed by the frost. I knew what species it was, though, and I tried to acquire others. I also realised that I had not chosen the right place to plant them. The bulbs were dug up and kept in a warm place in the summer. They quickly flowered. Another fritillary appeared in the garden – the white form of *F. meleagris*. Subsequently, I was able to buy the ‘Lutea’ form of *F. imperialis*, dug up at the worst possible time, whilst it was in flower.

Next, the first *Fritillaria* from the flora of the USSR appeared, *F. collina*. Of course, a lot of mistakes were made in its cultivation. There was very little written about it, accounts were contradictory and we had virtually no experience with it—hence failure.

But I became more experienced and my collection increased. I was able to meet other enthusiasts and friends who were making trips abroad. At the end of the 1990s a number of fritillaries became available commercially. There were, however, a lot of problems with identifying these plants, so, for example, bulbs



*Fritillaria kotschyana grandiflora.*



*Fritillaria regelii*\*.



*Fritillaria imperialis* type *argenteovariegata*.



*Fritillaria bucharica.*



*Fritillaria olgae.*



*Fritillaria aurea*\*\*.



*Fritillaria alburyana.*



*Fritillaria cirrhosa.*



*Fritillaria gussichiae.*

bought as *F. latifolia* turned out to be *F. grandiflora*, and in place of *F. kurdica* we had *F. maximowiczii*. Suspicions also arose in connection with material from China, e.g. incorrectly named bulbs of *F. maximowiczii*. What arrived under that name was conspicuously different from what I was growing. A friend of mine said that most likely I had got *F. dagana*, not *F. maximowiczii*, though he had only seen *L. dagana* in a herbarium. Possibly we'll be able to clarify the matter this summer, because I now know who has the real species.

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\* This is the first time I have seen this particular Frit: if any of the members have photos of this flower, I would be very grateful if you could send them to me for the image library—Bob Charman.

\*\* Please note this unusual colour form.



Konstantin the proud grower.



*Fritillaria stenantha*.



*Fritillaria caucasica*.



*Fritillaria collina*.



*Fritillaria pallidiflora*.

At present I am growing the following outdoors:

*Fritillaria acmopetala* Boiss

*Fritillaria affinis*

*Fritillaria alburyana* Rix

*Fritillaria armena*

*Fritillaria carica*

*Fritillaria collina* (*Fritillaria lutea*)

*Fritillaria davisii*

*Fritillaria graeca*

*Fritillaria guissichae*

*Fritillaria imperialis* L.

*Fritillaria kotschyana*

*Fritillaria maximowiczii*

*Fritillaria meleagroides*

*Fritillaria minuta*

*Fritillaria persica*

*Fritillaria pontica*

*Fritillaria pyrenaica*

*Fritillaria ruthenica* Wikstr.

*Fritillaria stenantha* Regel

*Fritillaria uva vulpis*

*Fritillaria whittallii*

*Fritillaria aurea*

*Fritillaria bithynica*

*Fritillaria bucharica* Regel

*Fritillaria camtschatcensis*

*Fritillaria caucasica*

*Fritillaria crassifolia*

*Fritillaria glauca* ('Goldilocks')

*Fritillaria grandiflora*

*Fritillaria hermonis* subsp. *amana*

*Fritillaria involucrata*

*Fritillaria latifolia*

*Fritillaria meleagris* L.

*Fritillaria michailowskyi*

*Fritillaria pallidiflora* Schrenk

*Fritillaria pınardii*

*Fritillaria pudica*

*Fritillaria raddeana* Regel

*Fritillaria sewerzowii* Regel

*Fritillaria ussuriensis*

*Fritillaria verticillata*

*Fritillaria zagrica*

Apart from the above-mentioned, I have *Fritillaria* which I can't identify for certain, name *FF. olgae* and *regelii*. These were received from Uzbekistan, from various sites. The differences concern height and the number of flowers. For



that reason, for the moment I can't say precisely whether it is a question of different species or whether we are dealing with variations within the confines of a particular species. Last year I was looking into differences between the flowers of various examples of *Fritillaria stenantha*. Some of them had been received from Uzbekistan and were clearly not *F. stenantha*. We suspect that amongst the *F. stenantha* bulbs there were a couple of *F. arianum* or *F. gibbosa*. That's quite odd, because our works of reference don't include Uzbekistan in the distributional range of these species.

There are a few *Fritillaria* received recently which are as yet unidentified. In all probability these are *F. cirrbosa*, *F. delavayi* and *F. thunbergii*. There are also some species which haven't flowered yet. We can't even guess what they might be. From my experience of growing frits it is possible to say the following:

- A. The majority are very undemanding and easily withstand extremely severe winters, e.g., *F. grandiflora*, *F. meleagris*, *F. imperialis*, *F. collina (lutea)*, *F. caucasica* and even *F. acmopetala*. During the 2002/3 winter they withstood frosts down to minus 20 degrees Celsius for weeks on end out in the open. Under a decent covering of snow, they coped with 30-35 degrees below. That was one of our severest winters in living memory. We get comparable winters only every ten to 15 years. Only a limited range of species demand special treatment. I'd include here *FF. bucharica* Regel, *olgae*, *persica*, *pudica*, *raddeana* Regel, and *stenantha*. I dig these up in summer and keep them in a dry place. *Fritillaria persica*, no matter what we try, does badly in the Moscow area. The double form of *F. camschatcensis* has also behaved capriciously. I haven't been able to keep it going for any length of time.
- B. As far as propagation goes, we can divide frits into three:
  1. No problems with *F. imperialis* and *F. meleagris*.
  2. Those which form offsets/rice grains: *F. acmopetala*, *F. affinis*, *F. alburyana*, *F. grandiflora*, *F. latifolia*, *F. maximowiczii* and *F. pudica*.
  3. Those which increase only by seed: *F. bucharica*, *F. caucasica*, *F. collina*, *F. meleagroides*, *F. olgae*, *F. raddena*, *F. rutbenica*, *F. sewerzowii*, *F. stenantha* and *F. zagrica*.

With the aim in mind of adapting my plants to local conditions, I try to grow my frits from seed. All my frits grow outdoors. I try to create for them conditions which approximate to what they enjoy in the wild, both in terms of light levels and soil. To increase their chances of successful overwintering, I cover them with a good blanket of dry leaves and fir branches whilst the frosts last. These are removed when the thaw comes in March or early April. Otherwise the leaves start to decay.

# Henry John Elwes (1846 to 1922)

*Col. Iain Ferguson (Chair of the Lily Group from 1978 to 1982) poses the question: "So was Henry John Elwes the father of the cultivation of the genus *Lilium* in this country?" and when you have read the following article you will have no doubt about his answer.*

A big, big, man by any measure in every way. Massive in stature complete with a black and iron grey beard, with a voice so powerful that he could summon gardeners from even the most far flung corners of his estate and the master of a huge range of natural sciences from big game to butterflies. But what is of particular interest to us is why our first Chairman, Sir Frederick Stern, should write of him in 1932 as "the father of modern lily cultivation" and select his portrait as the frontispiece of our first yearbook.

Henry John Elwes, H.J.E., was educated at Eton but he saw much more of the Windsor countryside than he did of the inside of a classroom. By the time he left he was a fine ornithologist and an expert taxidermist. In the course of the next three years he made three expeditions to the islands off the north and west coast of Scotland collecting specimens of seabirds and their eggs. He then joined the Scots Guards and managed during that time to visit every country in Europe. By now "wanderlust" had gripped him and in 1870 he left the Army and went to India. While birds were still his main interest his attention was also drawn to the butterflies of India and when, in due course, he returned home he brought back a large collection for the Natural History Museum.

Later that year he made his way to Sikkim and explored the little known mountains on the border of Tibet walking at 2,450 to 2,750 metres in a very remote and potentially hostile region. Now many of us have had the good fortune to see a stand of *Lilium*, or even a single stem, growing wild in its homeland, but just imagine how H.J.E. must have felt when he found himself amid rhododendrons,



Henry John Elwes, F.R.S., V.M.H.  
(1846-1922)

camellias and magnolias with, between them, scattered stands of *Cardiocrinum giganteum*. That really does seem to be the moment when, surrounded by such a profusion of form, colour and scent, he saw his future in the collection of new plants, in their identification and in learning how to grow them at home.

He came home in 1871 and married the perfect wife, a kind and gentle lady who also loved plants, particularly lilies, and who could tolerate (almost) a husband who, at breakfast would decide to go to China and by lunchtime would have gone! In 1874 H.J.E. made his first botanical expedition, with the sole purpose of plant collecting, to Turkey. There it was that he found the snowdrop that has borne his name ever since—*Galanthus elwesii*. He immediately arranged for a large number of bulbs to be lifted and sent home. Only a few of these established themselves but those that did provided the parentage of the many *elwesii* hybrids growing here today. On the same expedition he collected two new species of *Fritillaria*, some tulips, a crocus and *Chionodoxa luciliae*.

These were exciting times with new *Lilium* being discovered every year. Encouraged by his wife, H.J.E. tried to collect every species and in this venture was helped by the German botanist Max Leichtlin and George Wilson, a leading plant collector of the day and whose garden eventually became part of what is today the RHS Garden at Wisley. H.J.E. was a plantsman rather than a gardener. Of course, he enjoyed his visits to the great gardens of the day but, first and foremost, he was a collector of rare things and as such wanted to acquire the seeds or bulbs of every species as they were discovered. He grew these treasures in pots where they could be more easily examined, discussed and their needs understood. He was also well known for his generosity and, as Augustine Henry would record in his obituary, would often divide his only specimen of some rare plant for a fellow enthusiast.

At some point in the mid 1870s he started work on his Monograph of the Genus *Lilium*. He did not feel competent to write the text himself and persuaded J.G. Baker of Kew to assist him with this. A harder task was to find the right illustrator and for this he chose the most outstanding botanic artist of the day—William Hood Fitch. Mr Fitch was not an easy man to deal with and was sometimes criticized for “gilding the lily”, making his plants larger and more beautiful than nature had intended. However he told H.J.E. that “you never knew how much plants would improve under cultivation, and that if painted exactly as you saw them, as done by artists who are not well acquainted with their capacity for improvement, or not coloured a little more brightly than they seemed to be at first, the final result would be less true to life for all plates coloured by hand would fade in time.”

One German botanist wrote to H.J.E. that he had seen *Lilium monadelphum* growing in the wild and that the plate in The Monograph exaggerated its size

and number of flowers. The plate showed 13 flowers on the one stem. H.J.E. was able to reply that he grew this lily in his garden and, in the previous year, had 29 flowers on one stem. What he did not say however was that the lily had then died!

The Monograph was completed in seven parts in 1880 with 50 illustrations, life size, of most of the lilies then known and cultivated in the British Isles. One of the leading publishers of fine books, Mr Bernard Quaritch, offered to publish it and distribute it at ten guineas a copy. H.J.E. felt that this was too expensive



FIG. 1.—CAPTAIN H. J. ELWES, SCOTS GUARDS, 1869.

and went ahead on his own with a price of seven guineas a copy, as this would still cover the expenses of the production.

Of the 250 copies printed just under 200 sold quickly. However, with another expedition to India being planned H.J.E. sold the remaining 60 copies to Mr Quaritch for 300 guineas and he, in turn, put them in his catalogue at ten guineas. They all sold in a year.

The next few years were devoted to travelling. Between 1875 and 1886 he made three expeditions to the Himalayas and four to North America and Mexico. In addition to collecting plants and butterflies he became interested in trees and in due course, in collaboration with Augustine Henry, he would produce an immense work of seven volumes with over 2000 pages and 412 plates: "The Trees of Great Britain and Ireland."

In 1891 he inherited Colesbourne Park in Gloucestershire and settled down for a bit to grow the multitude of plants that he had brought back from distant places or been given by friends. There were successes and disappointments, the latter causing him to lament that "many successive would-be growers of lilies have learnt by sad experience that a good many of the most beautiful lilies cannot be kept alive for more than a few years in our most fickle and uncertain climate". He illustrated his point by relating how a forest officer in India sent him a large wooden case full of healthy bulbs of *Lilium neilgherrense*. Always generous he gave a lot of them to George Wilson, who flowered them in pots with great success. The following year he visited George Wilson and, knowing that his own plants at home had not survived, asked him how the *neilgherrense* were doing. Wilson at first pretended he had not heard the question but later had to admit that he had lost the lot. H.J.E. concluded that to succeed with this particular lily it needs to be planted in a border bed in a cool greenhouse. After all, in its natural home, it is the most southern of the *Lilium* family.

H.J.E. was a great admirer of the Japanese lilies, particularly *Lilium japonicum* and *Lilium rubellum*, but found them hard to grow and impossible to establish. His advice to others was to avoid Japanese grown bulbs and to grow these two species from seed and then pot up the small bulbs in almost pure oak leaf mould. However he believed in growing his seeds and bulbs naturally, was sceptical of the various methods being used to speed up germination and was not in favour of manure and artificial fertilizers. He recommended patience, maintaining that lilies were plants that should not be hurried. In 1913 H.J.E. decided that The Monograph must be updated to take into account the Chinese species that had been introduced by Ernest Wilson and George Forrest but, as he was now 67 and weakened by major surgery, he did not feel strong enough to take on the production himself. Fortunately he was by now a good friend of Arthur Grove, a recognized authority on growing *Lilium*, who had succeeded with

the growing of species that he and others had found impossible. H.J.E. asked him to take charge of the production of the new supplement and he, in turn, asked Arthur Cotton the botanist, and future keeper of the herbarium at Kew, to help. The Monograph would, like the earlier parts, rely heavily on beautiful illustrations and H.J.E. had no hesitation in “poaching” Miss Lilian Snelling, the best botanic artist of the day, from The Royal Botanic Gardens in Edinburgh. The supplement was published in 1933 and contained 25 newly introduced lilies that had been collected by Wilson, Farrer, Forrest and Kingdon-Ward.

On 26 November 1922 the great man finally succumbed to a serious illness and died. However, The Monograph did not die as, with the encouragement of Sir Frederick Stern, a second supplement was published in two parts in 1960 and 1962. The new supplement was sponsored by The Royal Horticultural Society, edited by Dr W.B.Turrill, the keeper of the Herbarium at Kew, and illustrated by Miss Margaret Stones. Perhaps it is now time for The Lily Group to think about another supplement?

So was Henry John Elwes the father of the cultivation of the Genus *Lilium* in this country? After all, he was not a botanist and, as he was the first to admit, was not the most successful of growers, nor did he find new species of *Lilium*. What he did do was to recognize and appreciate the beauty of the plant, spread the word, encourage gardeners to grow them, be the inspiration and driving force behind the first Lily Conference of 1901 and produce The Monograph which is accepted world wide as one of the greatest of all horticultural works and much treasured by those few fortunate enough to have a copy.

A big man in every sense of the word, he spoke with authority and volume and he spoke his mind. Inevitably some took offence at things he said but if he heard of that later he would apologise. If a man knew what he was about H.J.E. welcomed him as a friend and fellow enthusiast but he had no time for the half hearted. In one of his last letters he wrote “I have, during my life, taken an active part in most sports and occupations. I have crossed and recrossed the Himalayas and the Andes, explored Siberia and Formosa, shot and fished in Norway, and as I grow older I find there is more companionship, consolation and true pleasure in gardening and in plants than in anything I know.” I think Sir Fred got it right when he, supported by the Council of the RHS, chose the picture of Henry John Elwes to be at the very front of our first Lily Group Yearbook.



# Peter Hanson and *Lilium hansonii*

*In the last article: “Henry John Elwes (1846 to 1922)”*

*Col. Iain Ferguson wrote about the contribution Elwes made to the genus *Lilium*. In this historical note (first published in *The Lily Yearbook* 1949) **William T. Stearn** writes about the, ultimately, tragic life of Peter Hanson, wealthy artist and avid collector of lilies who was highly regarded by his contemporaries, Max Leichtlin and Henry John Elwes, who opined that Hanson had “one of the finest collections of Lilies in the world.”*

*Lilium hansonii* was introduced into European gardens about 1868 or 1869, bulbs being sent from Japan to Philipp Franz von Siebold, who then had a nursery near Leiden for the introduction of plants from the East. Siebold sold his few bulbs to another German, Max Leichtlin of Carlsruhe, who concluded that they represented an unnamed species. This he named *L. hansonii* or *L. hansonii*. A Latin description was published by Baker in his “Revision of the Genera and Species of Tulipae” (*J. Linn. Soc. Bot.* **14**, 211-310; July 1874), but neither he nor Leichtlin gave any explanation of the name. There is no doubt, however, that it commemorates an American lily enthusiast, a “Mr Hanson of New York”, who in 1877 had “one of the finest collections of Lilies in the world” (Elwes, *Mon.*, sub t. 34; 1877). Search through the *Gardeners’ Chronicle* and other likely sources of biographical information has yielded nothing further about Hanson. Since, however, it seemed unlikely that a man so noted in American horticulture and so esteemed by his European contemporaries Leichtlin and Elwes should have died without some local record, I asked the help of Mr Clarence McK. Lewis of New York, who in turn enlisted the help of Miss Dorothy S. Manks, librarian of the Massachusetts Horticultural Society, and Mr William E. Jordan, librarian of the Brooklyn Botanic Garden, together with numerous other persons who likewise searched diligently but with less success. They looked through many books and periodicals; about Hanson, unfortunately, there seemed nothing to be found.

At length Miss Manks supplied the first clue by finding a reference to Hanson in *Garden and Forest*, **4**, 46 (January 1891), where C. L. Allen of New York stated that “Herr Leichtlin sent some bulbs to the late P. Hanson, an enthusiastic amateur of Brooklyn, and named it *Hansonii* as a compliment to the friend that had sent him all our American species”. From this it is evident that Hanson had lived at Brooklyn and was dead by 1891 and that his initial was “P”. Mr Jordan supplemented this information by looking for P. Hanson in the early issues of the *Brooklyn City and Business Directory*. The 1888 directory, with a preface date of June 1887, listed him as Peter Hanson and gave his occupation as artist. The directory for the next

year did not list him but included his widow. Enquiry at Greenwood Cemetery, which was then the only large cemetery serving Brooklyn, brought forth the additional information that Hanson had died on 21st February 1887 at 26 Church Street, New York, although his residence was 220 Sixteenth Street, Brooklyn. His death was attributed to a heart condition and his age given as 63 years.

Baker's description of the Hanson Lily published in 1874 is antedated by a description in the *Horticulturist and Journal of Rural Arts* (New York), **27**, 92 (1872), which states: "*The Rural New Yorker* figures this new Lily. It was named after Mr Hanson, an artist of New York, by Max Leichtlin, of Carlsruhe, Baden." Unfortunately, the *Rural New Yorker* is now an extremely scarce periodical and the files of it in all the public libraries of New York are very incomplete. Ultimately Mr Lewis located in Vol **24**, No. 4, p. 6 (29<sup>th</sup> July 1871) the article on *Lilium hansonii* reprinted in *The Horticulturist*. This gives a little more information about Hanson and is illustrated by him. Moreover, it is important as the first publication of the name. It reads as follows:

"*Lilium Hansonii*. This new and beautiful Japan Lily was named by Max Leichtlin, Esq., of Carlsruhe, Baden, in honour of Mr. P. Hanson of 220 Sixteenth Street, Brooklyn, N.Y., and to whom we are indebted for the accompanying illustration. We believe that the plant in Mr. Hanson's garden is the first one of the kind that has bloomed in this country. This Lily is of a rather coarse and gigantic structure, attaining a height of from four to six feet. The leaves are produced in whorls, and are seven to eight inches long and two broad. The flowers are borne in clusters, and the buds being nearly globular they look very much like potato balls. The full expanded flowers are about two and a half inches in diameter, and the petals are very thick looking, more like wax than natural flowers. Their colour is also very peculiar, one side of the petals being yellow with a streak of white running through the centre; the other side is a brilliant yellow spotted with purple. It is not quite as showy a Lily as the *Auratum*, or some of the varieties of *speciosum*; still it is one of the most interesting and valuable varieties introduced in some time.

"Mr Hanson's specimen gave nine blooms this season, and we presume the number will be largely increased as the bulb becomes larger.

"In this connection it is proper to say that Mr. Hanson's business is that of an artist; but he is one of the most enthusiastic amateur florists among our acquaintance, paying especial attention to collecting and cultivating our native plants. There needs to be someone who will do this; and with a view to encouraging this work, we give Mr. Hanson's address above and request that readers of the *Rural New Yorker* who find in their respective localities any desirable flowering plants will forward specimens to Mr. Hanson's address. They will be duly appreciated and acknowledged."

This seemed as much as was likely to be found; then Mr Jordan's enthusiastic



participation in the hunt for Hanson, which brings to mind A.J.A. Symons' *Quest for Corvo* (1925), was rewarded by the discovery of a long report in the *New York Times* of Wednesday, 23<sup>rd</sup> February 1887, headed "Peter Hanson, the artist, found dead by his horrified wife." From this the following outline of Hanson's career is taken.

Peter Hanson was born in Denmark about 1824. He emigrated to the United States at the age of 27 and spent the next 36 years of his life there. He began painting frescoes and then developed a talent for landscape and marine work in oil. It sold well and he amassed a small fortune. During the American Civil War of 1861 to 1865 he served as a Captain in the 28<sup>th</sup> Brooklyn Regiment. He became an Odd Fellow and took the 33<sup>rd</sup> degree in Masonry, his neighbours liked him and his circle of friends grew. Tulips, lilies and American wild plants provided him with an absorbing hobby. Alas, "old Mr. Hanson, in spite of his pictures, his Tulips, his snug little fortune, and scores of old friends, was ill at ease and unhappy." His daughter married a man who treated her unkindly. The ill-matched couple and their four children lived with Hanson and apparently the atmosphere of the household was sometimes far from peaceful. Then the daughter died. Her husband struck Hanson and made threats against his life so violently that Hanson had him arrested. The husband then left Brooklyn, taking the four children with him to Philadelphia, much to Hanson's sorrow. This incident came to mind at the time of his death.

Although Hanson's residence and garden were at Brooklyn, his studio was in New York. He failed to return from work one evening; next day his wife found him lying dead on the floor of his studio. A mysterious young woman was reported to have visited him the previous afternoon, possibly with some demand from his rascally son-in-law. A post-mortem showed that his heart was badly diseased.

A visit by Mr Jordan to Hanson's Sixteenth Street address in Brooklyn revealed that "today the site is occupied by many ram-shackle one-car garages, roadways and a residence, the first floor of which has been altered so that autos can enter into the yard beyond. Only the stairway to the floor above is left of the first floor of the house. A sign proclaims that garages are for rent. There is nothing left to suggest that here an enthusiastic amateur once grew one of the finest collections of Lilies in the world."

Hanson is not known to have published anything about Lilies. He contributed, however, to the knowledge of the genus *Lilium* by obtaining bulbs of the American species and passing them on to his European correspondents Leichtlin and Elwes. He named *L. columbianum*. He also tried to hybridize various species. Leichtlin's dedication to him of the sturdy and handsome *L. hansonii* was thus more than an unearned compliment and has saved his memory from oblivion.

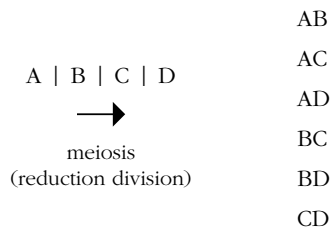
# Some thoughts on heredity... especially as they relate to Autotetraploidy

*In this article **Robert A. Griesbach**, who has produced some beautiful hybrid lilies, explains how an increase in the number of chromosomes can increase the potential for hereditary variability among offspring of autotetraploids.*

Polyploidy in the genus *Lilium* has been an ongoing experiment since the 1940s. Based on the significance of polyploidy—both naturally occurring and induced—in many plants, it has been hoped that it shall also eventually prove to be valuable in the breeding of at least some types of lilies.

Ordinarily the benefits of polyploidy are thought of mainly in terms of increased size of the various plant organs and increased plant vigor. It is the intention in this article to explain how an increase in the number of chromosomes can likewise increase the potential for hereditary variability among offspring of an autotetraploid<sup>1</sup> breeding population. In contrast to allotetraploids (amphidiploids), the four chromosomes of each type within an autotetraploid—12 different types in the case of lilies—are all homologous with one another, thereby allowing them to pair with one another during meiosis. Because of such pairing capacity the four chromosomes of each type are capable of independent segregation.

Note: The letters A, B, C & D in the following illustration of independent segregation identify the four chromosomes of a particular type.



Since genes are located on chromosomes they too are capable of independent segregation in the case of autotetraploids.

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<sup>1</sup> See Glossary for definition of underlined words.

Gregor Mendel's famous studies involving (diploid) garden peas demonstrated how the inheritance of seven different traits (stature, color of seeds, shape of seeds, etc.) was in keeping with his notion of simple dominance/recessiveness. Of the two unit factors (genes) underlying each trait, one proves completely dominant over the other. Thus AA and Aa genotypes result in the same dominant phenotype. The alternative recessive phenotype occurs only in the absence of A.

Assuming familiarity with this simple concept of Mendelian heredity, it follows that a cross between heterozygous diploid parents results in a  $\frac{3}{4} : \frac{1}{4}$  ratio of dominant over recessive offspring as shown below.

Parents: Aa x Aa

Egg Types	Sperm Types	=	Zygote (offspring) Types	
$\frac{1}{2}$ A	$\frac{1}{2}$ A	=	$\frac{1}{4}$ AA	→ $\frac{3}{4}$ A- Dominant Phenotype
	$\frac{1}{2}$ a	=	$\frac{1}{4}$ Aa	
	$\frac{1}{2}$ A	=	$\frac{1}{4}$ Aa	
$\frac{1}{2}$ a	=	$\frac{1}{4}$ aa	→ $\frac{1}{4}$ aa- Recessive Phenotype	

When diploid parents are heterozygous for a pair of alleles that are located on a pair of homologous chromosomes (e.g., Aa) they are expected to form two types of gametes, A and a, with equal frequency. In turn the expected probability for the various combinations of egg and sperm is equal to the product of their separate probabilities. In the case of a cross between heterozygous autotetraploids (AAaa x AAaa) the expected (ideal) ratio of dominant offspring (A- - -) to recessive offspring (aaaa) is  $\frac{35}{36} : \frac{1}{36}$ , respectively.

Egg Types	Sperm Types	=	Zygote (offspring) Types	
$\frac{1}{6}$ AA	$\frac{1}{6}$ AA	=	$\frac{1}{36}$ AAAA	→ $\frac{35}{36}$ A- - -
	$\frac{4}{6}$ Aa	=	$\frac{4}{36}$ AAAa	
	$\frac{1}{6}$ aa	=	$\frac{1}{36}$ AAaa	
$\frac{4}{6}$ Aa	$\frac{1}{6}$ AA	=	$\frac{4}{36}$ AAAa	
	$\frac{4}{6}$ Aa	=	$\frac{16}{36}$ AAaa	
	$\frac{1}{6}$ aa	=	$\frac{4}{36}$ Aaaa	
$\frac{1}{6}$ aa	$\frac{1}{6}$ AA	=	$\frac{1}{36}$ AAaa	→ $\frac{1}{36}$ aaaa
	$\frac{4}{6}$ Aa	=	$\frac{4}{36}$ Aaaa	
	$\frac{1}{6}$ aa	=	$\frac{1}{36}$ aaaa	

Note: The frequencies of AA, Aa and aa gametes are based on the independent segregation of the four homologues during the course of meiosis.

Unlike cases of simple dominance/recessiveness, wherein a single copy of a dominant gene is sufficient to ensure full expression of a dominant phenotype, modes of inheritance exist in which levels of phenotypic expression vary according to the number of genes capable of contributing toward a given effect. For example, in many crosses involving flower color, the presence of two effective alleles results in the formation of more pigment than when only a single copy of that gene is present. In the absence of an effective allele, flowers are devoid of pigment and are hence white.

A – Effective, a – Ineffective

AA = dark colored

Aa = medium colored

aa = white

In the case of diploids, the three different phenotypic classes of offspring would be expected to occur, following a cross between heterozygous (Aa) parents, with the following frequencies:

$1/4$  AA (dark):  $2/4$  Aa (intermediate) :  $1/4$  aa (white)

In autotetraploids there can exist as many as four effective alleles within an individual. Likewise, individuals with three, two, one or zero effective alleles can exist. In the case of a cross between heterozygous parents (AAaa x AAaa) five different genotypic classes would be expected to occur with the following frequencies:

$1/36$  AAAA     $8/36$  AAAa     $18/36$  AAaa     $8/36$  Aaaa     $1/36$  aaaa

(See preceding example of Egg/Sperm/Zygote types in (AAaa x AAaa) cross)

Along with this expansion in the range of genotypic diversity in autotetraploids, one might well expect a corresponding increase in the numbers of phenotypic classes.

The above discourse points out the difference between diploids and autotetraploids with respect to incomplete dominance (the “blending” mode of inheritance), which involves a single pair of alleles that are located on one particular chromosome type.

Of even more widespread hereditary significance among most organisms is the so-called quantitative mode of inheritance, which involves more than a single pair of alleles affecting a given trait. The greater the number of pairs of non-allelic genes involved, the greater is the range of variation that is possible. For diploids, doubly heterozygous (AaBb) individuals would be expected, on the basis of independent chromosome segregation, to form four types of gametes (AB, Ab, aB, ab) with equal frequency. In turn, a cross between two doubly heterozygous (AaBb) individuals would be expected to produce offspring with four, three, two, one and zero contributory genes with corresponding frequencies of:

$$1/16: 4/16: 6/16: 4/16: 1/16$$

It should now become quite obvious that in autotetraploids involving two different (non-alleles) pairs of genes (Aa, Bb) why doubly heterozygous parents (AAaa, BBbb) would be expected to give rise to an increased number of offspring types. More specifically, compared to the five different phenotypic classes of offspring possible for diploids, doubly heterozygous autotetraploid parents can give rise to offspring belonging to nine different phenotypes (individuals carrying 8 contributory genes, or 7, 6, 5, 4, 3, 2, 1 or zero).

Upon considering the quantitative mode of inheritance—especially in cases involving several pairs of independently segregating genes—one can appreciate why many traits are inherited in a “more or less” rather than an “either or” manner.

Note: To complicate things even further, it should be mentioned that the actual expression of a quantitative trait is often influenced by environmental factors. Thus for example the actual size of flowers produced by a plant is not solely based upon its genotype but is likewise in response to such things as moisture availability, day length, light intensity, temperature, etc.

Hereditary variation with respect to some traits is the result of multiple allelism. In the cases considered thus far, i.e., simple dominance/recessiveness, blending or incomplete dominance and quantitative inheritance, the individual genes that exist at a given chromosome locus exist as one or the other of two versions. In the case of multiple allelism, one or another of three or more versions can exist at a given gene locus.

Blood groups of the A, B, AB and O series in man might well serve as an example of multiple allelism. In this example, three versions of the gene exist:

- $I^A$  = codes for antigen A
- $I^B$  = codes for antigen B
- $I^O$  = lacks the capacity to code for antigens A and B

Note: Gene  $I^A$  is dominant over  $I^O$   
 Gene  $I^B$  is dominant over  $I^O$   
 Genes  $I^A$  and  $I^B$  are co-dominant

Genotype	Antigens produced	Blood Group
$I^A I^A$	A	Type A
$I^A I^O$	A	Type A
$I^A I^B$	A+B	Type AB
$I^B I^B$	B	Type B
$I^B I^O$	B	Type B
$I^O I^O$	–	Type O

In the case of diploid organisms any one individual is capable at best of possessing two different versions of the multiple allelic series in question. Autotetraploids are capable of possessing as many as four different alleles of a given series—one in each of the four chromosomes of the type in question. Thus in cases involving multiple allelism, autotetraploids are capable of producing offspring with a greater degree of genotypic diversity than is possible with diploids. Based upon the concepts of dominance, semi-dominance, co-dominance and recessiveness, one might expect that accompanying the increase in genotypic diversity there is likewise an increased potential for phenotypic diversity.

In addition to so-called “main-line,” genes that are involved in the expression of a particular genetic trait, there also exist hereditary units that modify such expression. Some such modifying factors depress or even inhibit, while others enhance, the expression of main-line genes.

In *Gladiolus* and in tall bearded *Iris* as well as in certain other plants there exists a dominant inhibitor gene that prevents or greatly restricts the expression of a gene that otherwise is capable of promoting the synthesis of a water-soluble anthocyanin floral pigment.

In lilies the number, size and distribution of floral spots might possibly involve the action of modifying genes. By virtue of possessing more copies of such modifying units, auto-tetraploids can be expected to exhibit a greater degree of such gene modification than is possible at the diploid level.

A gene consists of a section of the helical double-stranded DNA (deoxyribonucleic acid) molecule comprising approximately one thousand pairs of nucleotide subunits (Adenine, Thymine, Guanine, Cytosine).



*Above, 06RGD06. Below left, Griesbach #29. Below right, DSC\_0337.*

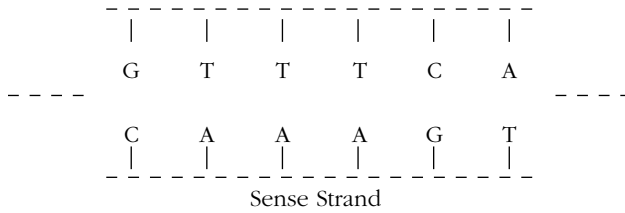




*Above, DSC\_0355. Below left, Griesbach #31. Below right, DSC\_0340.*

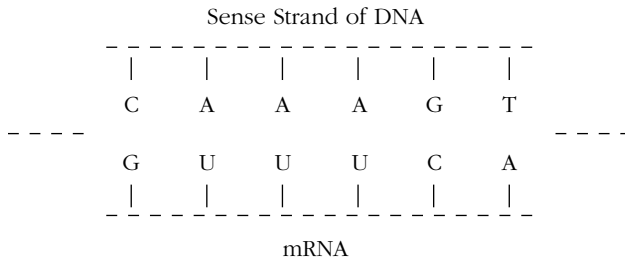






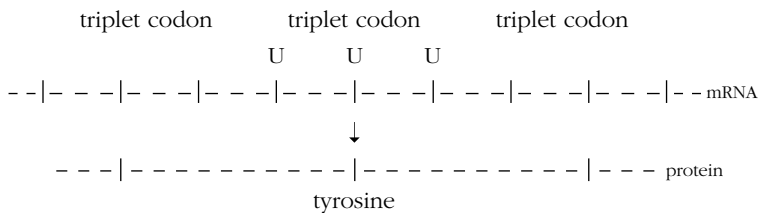
Upon activation of a gene, one of the two strands of DNA—the sense strand – serves as a template for the synthesis (transcription) of a single-stranded mRNA (messenger ribonucleic acid) molecule. RNA, like DNA, consists of a series of nucleotide subunits (A, G, C and Uracil).

During the course of transcription, A is inserted into the RNA strand wherever its complementary unit, T, appears within the sense strand of DNA. In turn, G gets incorporated within the mRNA opposite the location of C. C appears within RNA opposite the position of G within DNA. Finally, Uracil gets incorporated wherever Adenine is located within the sense strand.



Messenger RNA molecules, which now possess “information” from a specific kind of gene, find their way from the nucleus to the cytoplasm of a cell where they in turn become associated with structures called ribosomes. Ribosomes are where protein molecules are synthesized. Protein molecules typically consist of some three hundred or so amino acid subunits. Twenty different kinds of amino acids serve as protein subunits. The number of, kinds of, as well as the positions of, amino acids within a given protein molecule is determined by the number of, kinds of and relative positions of trinucleotide subunits within a specific kind of messenger RNA.

Note: The genetic code is a triplet code with each combination of three successive nucleotides within an RNA molecule coding for one amino acid. For example UUU within mRNA codes for the amino acid tyrosine within the protein molecule.



Thus information contained within a gene (DNA) is transferred via mRNA to a protein, where, through its action as an enzyme (or part of an enzyme), a specific chemical reaction underlying a specific hereditary event is made possible.

As has been known for some time, there is present within each cell of an organism much more nuclear DNA than can be accounted for by the number of genes present. It is now known that much of this non-genic DNA codes for RNA molecules that function as gene regulators. As is well known, the vast majority of cells that make up body tissues possess a full complement of genes, as was originally present within the fertilized egg (zygote). Quite obviously, then, during the course of development of an organism there is a time and place wherein certain genes are “turned on” while certain genes are “turned off.”

Without going into detail, it might be pointed out that in polyploids there is more regulatory DNA present than in corresponding diploids. One might therefore wonder whether such additional non-genic DNA is of significance with respect to gene regulation.

Returning to the main theme of this article—increased potential for variation via autotetraploidy—it should be pointed out that the potential for variation within a breeding population is directly related to the diversity within the gene pool. As an example one might point out that success with daylilies at the autotetraploid level gradually increased, starting in the 1950s and 1960s, as more and more desirable gene variations were added to the tetraploid gene pool via new conversions of selected diploids. One might well anticipate that autotetraploid Trumpet/Aurelian, and to a lesser extent autotetraploid Asiatic lilies shall likewise prove more successful following the conversion of additional selected diploid cultivars.

It has been observed in a number of cases that when closely related diploid plants are routinely selfed, back-crossed to parents and/or sibbed (crossed between sister offspring) there is a gradual decline in vigor. At least in part such seems to be the consequence of ever-increasing homozygosity at the various gene loci. Insofar as autotetraploids possess four loci for each gene in contrast to two in diploids, it would be reasonable to predict that overall homozygosity would be less rapidly attained, thus accounting for a less rapid decline in “hybrid vigor” during the course of a comparable extent of inbreeding at the tetraploid level.

One last point concerning autotetraploidy—Insofar as the four chromosomes

of each type are capable of pairing with one another, two-by-two separation during the course of meiosis does not always occur. As a consequence, a certain percentage of the meiotic products end up with more than or less than the normal (2x) number of chromosomes. Therefore, autotetraploids tend to be less fertile than the comparable diploids from which they were derived. It might be pointed out that partial sterility is of lesser significance on the male side due to the enormous number of pollen grains formed. On the female side, partial sterility is typically of more significance insofar as seed capsules usually possess a somewhat limited number of ovules. However, especially in the case of autotetraploid Trumpet lilies partial female sterility has not proved to be a hindrance to breeding due to the large number (up to a few hundred) of ovules present within a single capsule. By way of contrast, because of the limited number of ovules within daylily capsules, the early tetraploids proved to be much more pod sterile than pollen sterile. Seemingly, through selection breeders have been able to improve female (egg) fertility.

In conclusion, in addition to the beneficial effect of polyploidy with respect to increased vigor and size, one might likewise appreciate the increase in potential variability among the offspring of autotetraploids. With respect to the relationship between size and ploidy, one might point out that in autotetraploid *Gladiolus* one can select for floret size as small as two inches in diameter and as large as five.

### **Glossary:**

#### Allele (allelomorph)

During the course of time mutations at the DNA level of the genes occur. Minimally, a single nucleotide base pair might be altered at a given point along the DNA making up a gene. For example a Guanine/Cytosine pair might be replaced by an Adenine/Thymine pair. The effect of gene-level mutations not only depends on the exact nature of DNA alteration, but likewise on where it occurs within DNA. In some cases, the altered gene is rendered totally inactive. In other cases, mutant genes might lead to altered appearance (phenotype). The various versions of a given gene at a given locus on a given chromosome type are referred to as alleles.

#### Auto- vs. Allopolyploidy

An autotetraploid may arise naturally following the spontaneous doubling of the chromosome number of a normal fertile diploid. Different mechanisms of such polyploidization have been described in the literature. In turn, an autotetraploid can be artificially induced, mainly by means of mitotic spindle inhibition following chemical treatment of mitotically active somatic tissue of a diploid.

The condition of autopolyploidy exists when the three or more chromosomes of each type are all homologous with one another. Their high degree of "sameness" due to their origin from a single species, or closely related species, is such as to allow synapsis (intimate pairing) with one another during meiosis.

Allopolyploids, on the other hand, possess chromosomes derived from species that are genetically distinctly different from one another. As a consequence, their relative lack

of sameness with respect to the chromosomes of a given type restricts, or even prevents, synapsis between the chromosomes of dissimilar species origin.

In the case of allotetraploids the two chromosomes of a given type that had their origin from one of the species parents, being homologous with one another, are capable of pairing preferentially with each other. In turn, the two remaining chromosomes of the particular type in question that arose via the other species parent are likewise capable of homologous pairing:

----- A, ----- B  
----- A, ----- B

The letters A and B denote unlike species origin of the four chromosomes of a different type. Allotetraploids in nature arise primarily through the involvement of unreduced gametes. Artificially, allotetraploids can be induced following chemical treatment of mitotically active somatic tissue of wide species hybrids.

In the case of polyploids above the tetraploid level, as for example hexaploids, a combination of auto- and alloploidy can coexist. Thus AAAA BB represents an auto-allohexaploid (The letters A and B represent chromosome sets of unlike species origin).

#### Chromosome homology

Chromosomes are homologous if they possess a high degree of "sameness" with respect to one another. Each body (somatic) cell of a normal fertile diploid plant typically possesses a specific number of chromosome pairs, each of which is microscopically identifiable by virtue of its length, position of its centromere (point of spindle fiber attachment), as well as other morphological features. The chromosomes of each homologous pair are likewise of similar DNA constitution. Homology of chromosomes becomes especially significant during the process of meiosis, the process that results in the reduction of the chromosome number from  $2N = 2X$  to  $N = 1X$ . (In lily,  $2N = 24$  to  $N = 12$ ). In order for meiosis to proceed normally, the two chromosomes of each type (12 different types in lily) must be capable of pairing intimately with each other, and such is possible only under conditions of a high degree of sameness, or homology, between the chromosomes involved.

In the event that the two chromosomes of each pair had a different evolutionary origin, as would be the case in wide interspecific hybrids, the relative lack of sameness (or homology) either decreases or even may prevent the intimate pairing process necessary for meiosis to proceed normally. Thus diploid wide species hybrids are typically quite sterile.

Note: At least in some wide species hybrids a diminished capacity for pairing between the chromosomes of different species origin is possible. Such is referred to as pairing between homoeologous chromosomes.

#### Homozygous vs. heterozygous state

The homozygous condition prevails in the case of a diploid organism when the corresponding loci of a given pair of homologous chromosomes possess the same allelic form of a given gene; for example, AA or aa.

In the case of autotetraploids, AAAA and aaaa would be homozygous conditions, while AAAa, AAaa, Aaaa would represent heterozygous conditions for the alleles A/a.

#### **Footnote:**

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# News from the old martagon country

***Petr Šrůtka**, from the Czech Republic, charts his admiration of *Lilium martagon* from when he first saw it in its natural habitat (since when, sadly, its numbers have declined) to creating his own richly coloured hybrids.*

*Lilium martagon* is one of two species of lilies naturally occurring in the Czech Republic. The second species is *L. bulbiferum*, which is much more scarce and grows only in mountains.

When I decided to study forestry I soon had the opportunity to see *L. martagon* in its natural habitat and I have to confess I was amazed by the beauty of this plant. During my study, I had to put theory into practice and in one place, in particular, there was a plentiful occurrence of martagons. Each day, I walked around one of them, which was even taller than me (180cm). I remember an exclusion enclosure, which originally had been built to protect young pines, but, in fact, was full of martagons because women workers, when mowing grass, around young pines, with tender hearts cut the grass but not the martagons. So this enclosure was more of a protection for martagons than for pines (in our forests you have to construct enclosures to protect young trees from grazing by wild game).

Since that time, it is easy for me to recognize this plant among others, even in its non-flowering state. Trained eyes are invaluable in nature, and familiar things “make a stroke to my eyes” as it is said here.

## **From the forest to the garden**

Some years later I planted a martagon bulb in my garden and in spite of the fact that it was dug up as a bulb with sprouting “nose”



*Lilium martagon* photographed in the Czech countryside.

in the spring, the colour of the flowers was extraordinary—white with purple dots—it was *L. martagon* var. *albiflorum*.

When I contacted lilygrowers living locally, (in the former Czechoslovakia there were three lily societies, while today in the Czech Republic there are also three societies and what appeals to me is that one of them is called MARTAGON), I noted that there existed whole groups of hybrid lilies derived from *L. martagon*. Unfortunately, only a few of these hybrids could be bought or obtained from lily friends at that time. At last I succeeded in obtaining some of these hybrids, i.e. 'Romeo', 'Ariel' and 'Claude Shride'. Those lilies were in fact delivered by the late Jan de Graaff, who, in 1968, visited Czechoslovakia



*Lilium martagon* var. *albiflorum*, the first clone the author collected in the wild.

and held two lectures in Prague. After that I bought *Lilium hansonii*. I then decided to create my own hybrids. As mother plants I used mostly two varieties of *L. martagon*—var. *albiflorum* and var. *typicum* and also the above mentioned hybrids, and as a pollen parent *L. hansonii* and martagon hybrids.

From the beginning it was clear not everything is possible or easy. The pollen of *L. hansonii* is surprisingly highly fertile, when applied to the stigmas of *L. martagon*, so this is easy. On the other hand, the crosses among martagon hybrids are not always easy and, usually, there are only a few seeds from such crosses. The rule for these crosses is, the higher the hybrid is in the 'blood' of *L. hansonii*, the better it is as the father (pollen parent) and the worse it is as the mother. Botanic variants of *L. martagon* are willing mothers, when pollen of martagon-hansonii hybrids is used.

Later on, I got an excellent example of *L. martagon* var. *cattaniae*, which I used as a mother and a father. My best hybrids have their origins in these crosses. As pollen parents I have used the aforementioned de Graaff clones 'Romeo', 'Jupiter' and later also 'Claude Shride'. Most of the seedlings inherited larger flowers, which was a trait of both parents. Many visitors to my garden are surprised by this size of these flowers, i.e. about 6cm across. Some red colour

is in all of the seedlings. Some of them are rather more orange or 'mahogany', while the number, size and the form of the dots is variable. From the aesthetic point of view, the disadvantage of these seedlings is a green stem, sometimes having purple blotches only in some parts of a stem.

Also, the results with crosses among varieties of *L. martagon* are very interesting. *Lilium martagon* var. *cattaniae* has been used as a pollen parent, while the mothers were *L. martagon* var. *album*, *L. martagon* var. *albiflorum* and *L. martagon*. Of course, all the lilies were again red and have smaller flowers inherited from the mother's side. However, the colour is not exactly the same, as each red is a different shade! Some of these hybrids have a matchless shade of a red colour. In one case, I cannot decide if the colour is pink, or red. Unfortunately this seedling was not very hardy and disappeared in one winter.

An interesting case was with one extraordinary clone of *L. martagon* var. *album*, which was very hardy and had a better appearance than other whites. This clone refused to produce any seed, although the seedpods were normally inflated. When one of my colleagues counted the chromosomes, he found that it was a triploid. Probably, this clone was from Jan de Graaff's selection '*L. martagon album superbum*'. Unfortunately, all three bulbs I had were eaten by mice during one very snowy winter.

I have noticed that the main source of variability in the martagon hybrids is *L. martagon* itself (of course and all its varieties). Only with the use of crosses among its varieties, or specimens of *L. martagon* with some desirable trait, is it possible to grow and select extraordinary and strange 'hybrids', especially in the F<sub>2</sub> generation. Just look at the picture of *L. martagon* var. *cattaniae*, with white circles instead of the usual dark dots, for such an example. As far as I know, it is still the case that nobody focuses on hybridization in this way. To reach this goal, it would be necessary to investigate the wild populations for extraordinary specimens, which is rather difficult today.

At present, one can get many martagon hybrids. Some of them are worth having, but the price is rather high and, of course, I can grow similar hybrids myself. Some hybrids, on offer, are still close to *L. martagon* and there is no reason for me to spent money on them. On the other hand, many hybrids look pretty and have some desirable traits. Undoubtedly, their different features would enrich my future seedlings with vigour or, for example, by dark colour in the stem. And, still, none of my hybrids possess good yellow colour.

My results with *L. tsingtauense* are rather poor. One of my findings is, again, that *L. tsingtauense* itself is the best pollinator of martagon-tsingtauense hybrids. Of course, better results may appear in the progeny of a cross of two tsingtauense hybrids, because of the segregation of traits in the F<sub>2</sub> generation. The trouble is, that when you cross two tsingtauense hybrids here, usually no seed

is produced or, at best, very few seeds. Usually the seed pods abort during a four week period. The fertility among martagon-hansonii hybrids and martagon-tsingtauense hybrids is also very limited or even none. Perhaps lily growers in the UK have different experiences, but remember that the morning temperatures here, in the second half of summer, can drop below 10° Celsius. This probably is the main reason for the aborting of seedpods.

My last experience is, that repollination (pollination again after two days, or even further pollination after four days—all with the same pollen) can help crosses to be successful and that the pollen of *L. hansonii* is accepted by some martagon-tsingtauense hybrids.

Another point I would like to make, in relation to martagon hybrids, is that I regret greatly that American species lilies and their hybrids are not available, here, and even if they were it is doubtful they could stand our garden conditions. However, I think the future progress for martagon hybrids is in hybridising them with American lilies. It would be necessary, in these crosses, to use American lilies especially as pod (mother) parents, because the mother parent passes on more traits than a pollen parent (this rule mostly governs in plants).

### **From the garden back to the forest**

As I mentioned above, *L. martagon* occurs in the Czech Republic in some localities in the wild. These places are known mostly by botanists and/or local people, while other people have, usually, never seen this plant growing wild. In the local population usually only a few plants bloom (and the blooming time is only two weeks in the summer). The majority, of martagons, survive in a sterile state, and disappear very soon, some plants even at the beginning of June.

In our meetings, my colleagues always state that *L. martagon* is very rare—if not nearly extinct—this I have heard probably a hundred times. As I could not stand this rather false claim, I said that this lily is, in some regions, quite common and that I have seen, in my life, thousands of individual plants of *L. martagon* (of course, most of them were ‘sterile’, non-flowering individuals). In response, my colleagues looked at me as if I had just landed from Mars, but then they wanted me to point out where these lilies could actually be found.

Three years we walked our forests in the special places in June, and they had to finally confess that we had really seen thousands of wild martagons (thanks mostly to one locality, where many lilies grow).

*Lilium martagon* really is not common in every forest, but if you visit broad-leaved stands with oaks, hornbeams and lime trees, with calcite or basalt in the substratum, you can find lilies here. Even in the mountains there are some places in the forest margins and meadows with *L. martagon*, but only where limestone





**Above left**, This lily is a triploid clone of *L. martagon* var. *album*, probably Jan de Graaff's *L. martagon* var. *album superbum*. **Above right**, 'RedAsCherry', a hybrid between *L. martagon* var. *cattaniae* and *L. martagon* var. *album*.

**Below left**, A hybrid between *L. martagon* var. *cattaniae* and 'Claude Shride'.

**Below right**, A hybrid between *L. martagon* var. *cattaniae* and 'Romeo'.



is in the substratum. In general, *L. martagon* is not an alpine plant, but a broad-leaved forest plant. The most enchanting fact, when you see wild martagons in flower, is that you are not able to find two similar examples—there is great variability here, for example, inside/outside colour (shade) of petals, number and size of spots, size and number of flowers, length and shape of pedicels etc. One thing is the same on one site—the time of blooming. On the other hand this varies among populations.

### **Threats to martagons in their forest habitat**

So, I pointed out the lilies to my friends. After that, they pointed out the lilies to other people. We stopped walking the forests for martagons in the year when we found as many as 50 holes instead of lilies, and, unfortunately, in the best locality. I have to emphasize, that I have always and repeatedly reminded my colleagues, that we need not dig up bulbs, because, as specialists, we can take pollen, seed or a few scales to fulfill our needs. However, I have found that I cannot be responsible for more people than one (myself), in this respect.

In the place of the exclusion enclosure (mentioned at the beginning of this article), no lilies grow today. The reserve for mouflon (a type of wild sheep) has been built at that place and mouflons quickly consume and destroy the herbaceous cover in such a way that you can see only gravel and loam instead of plants. I know two places where martagons grew in the past, but today they are game reserves for mouflon.

Also cows eat lilies, too. On the forest margins or in the old meadows in the past re-grown with forest, sometimes martagons grow. In a number of cases these places are pastures for livestock today. Personally I know two places, again, where cows eat up the lilies.

At the location with thousands of martagons each year wild boar dig up and eat lily bulbs. Since World War II, when wild boar escaped from the game reserves, their population has increased year by year. These animals are very clever and wary, so they cannot be hunted easily—“you cannot shoot them from your bed”, as it is said here. To be successful in the hunt, you have to be very frequently outdoors, especially in the late evening and early morning. That is why the losses in the fields and in the forest are greater year by year, including martagons.

*Lilium martagon* is protected by law in the Czech Republic, as are many other plants and animals. However, this general protection has not prevented the martagon lily from being exploited in some localities and from vanishing in areas where it was once fairly common.



*Lilium bulbiferum* in the Val Bavona, Switzerland



## ***Lilium bulbiferum* in Val Bavona, summer 2008**

*It is always a pleasure to read about lilies growing in their natural habitat, as **Pontus Wallstén** illustrates in this article about *Lilium bulbiferum* growing in a remote valley in his native Switzerland.*

In the spring of 2007, Jeff Coe informed me that he had been in contact with Sir Peter Smithers' gardener, Hansjurg Albrecht, who had told him about a remote alpine valley in the canton of Tessin, in the south of Switzerland, where *Lilium martagon* and *Lilium bulbiferum* grew in scattered patches and in certain places in quite abundant numbers.

Having previously seen *Lilium bulbiferum* growing wild in Sweden, but only two plants, I marvelled at the thought of seeing several of these magnificent lilies in full bloom in a sunny Swiss mountain pasture.

When I contacted Hansjurg Albrecht, in the early summer of 2007, he informed me that he had been ill and so had not had time to cycle the 70km trip he usually makes to the valley (in the course of a day!) to see the lilies. He also said that a recent hailstorm might have smothered the lilies, so it might be a wasted trip to

travel all the way to the valley and then not see anything. We both agreed on this, and while Hansjurg was recovering from his illness and starting to plan his cycling trip to England, which he does in less than two days, we said we would postpone our *bulbiferum* trip to the next year (2008).

After what felt like a short while it was 2008 and the summer was approaching, so I got in touch with Pat Huff and asked her if she would be interested if I made a short film about *Lilium bulbiferum* for the lily group website, that included an interview with Hansjurg Albrecht, who is now 72 years old, talking about his years as a gardener with Sir Peter. Pat said she was interested, so I prepared a preliminary outline as well as some questions for the interview with Hansjurg.

In the summer of 2008 the weather was on my side and Hansjurg was in good health. In fact he called me in early June to tell me he had just cycled back and forth to see the lilies and said they were starting to flower! This set my pulse racing! Then came a question from Hansjurg which set my pulse racing even faster...this time not from excitement...but from fear "Are you fit? Are you good at cycling?" and I said that my cycling skills were ok, and that I had cycled 30 kilometres a few days earlier to a garden centre... He told me that the reason he was asking was that to see the *Lilium bulbiferum*, we might have to cycle 70km!

I was relieved however when Hansjurg called me later on and said he had found out that there were a series of post buses that would be able to take us very close to the location!

Knowing this, and also having heard a good weather forecast, I set off towards Val Bavona on a long train journey, which would take me through several steep alpine valleys, down to Domodossola in the north of Italy and finally to Locarno, on the borders of Lago di Maggiore. It was very interesting to notice along the way how the vegetation changes as you get further south, starting off with the "normal" countryside vegetation, vineyards and wheat plantings, as well as mixed woodland and orchards, which are slowly replaced by palm trees, oleanders and other exotic vegetation as you get further south.

At the station in Locarno I was met by Hansjurg who was waving a bright red Swiss passport, so I would find him easily. He explained that he had cycled the 15 or so kilometres to the station from his house, since he didn't have a car, but that I could take a bus with my film gear up to his house, where he would meet me, since he would be able to cycle back and reach the house before the bus arrived. He also explained that the palm trees I had seen on the way, growing in woodland and alongside the railway tracks, are considered to be a weed in the canton of Tessin, since they are very vigorous and even tolerate a bit of frost once in a while.

Hansjurg's flat is within a large building surrounded by his fairly large garden. During a tour of the garden Hansjurg showed me a large collection of



**Above and opposite,** Three photographs showing variation among *Lilium bulbiferum* flowers.

over 200 ferns, as well as various lilies such as *L. regale*, *L. regale* var. *album*, *L. hansonii*, 'Marhan' (*L. martagon* var. *album* x *L. hansonii*) and various other hybrids and other fascinating bulbous plants. While in this area, I could clearly understand why someone like Sir Peter Smithers would choose to settle here and build up a garden in this region. The climate is excellent, i.e. it barely ever experiences frosts, which means you can grow almost anything you want, in other words a gardening paradise! Another asset is also the mild springs, which means that magnolias, of which Sir Peter grew many, flower in profusion without being damaged by late frosts or excessive amounts of rain. This climate also meant that Hansjurg could grow thriving clumps of *Crinum*, *Amaryllis belladonna*, nerines, gladiolus, zephyranthes and *Sprekelia formosissima* in his outside borders.

Next morning, we got up at 6am in order to catch the only bus at 8am, which would take us half way up the mountain, to a small village surrounded by fabulous gorges, cascading waterfalls, rushing rivers and old stone houses. At first the bus was very empty, but quickly it filled up with school children which meant that after a while the trip became quite lively and quite noisy, as we zigzagged up the steep turns of the mountain roads. Then we approached a small alpine village with only 12 inhabitants and as we circled further up the mountains the houses, villages and their inhabitants became even fewer in number.

Once in a while we saw the orange gleam of single plants of *Lilium bulbiferum*



by the roadsides, indicating that we were not far from our goal. The excitement rose!

After changing buses and circling further up the mountain, past spectacular waterfalls and more gorges, we reached our destination. By then we were the only passengers left on the bus. When we got off the bus we headed for the remote alpine valley in which the *Lilium bulbiferum* plants grew. However, if we were not to be stuck on the mountain until late that evening we had to take the next and only bus back, which was scheduled to leave in just over an hour. This meant that we had a little less than an hour, at the location, to make the short film, including the interview with Hansjurg, for the RHS Lily Group website, photograph as many different forms of *Lilium bulbiferum* as possible and also note any other exciting plants we found—quite a challenge!

We started off by having a quick look around. There were about 70 *Lilium bulbiferum* in flower, some were fully in flower, others going over, while others had not yet started flowering.

These were spread out in the very large mountain meadow, which must have been at least 400 metres in length by 100 metres wide. When I say spread out I am not exaggerating, since even though we came across one or two clumps with four or five plants growing together, most were single plants, spaced apart by at least 40 metres in all directions.

What was extremely fascinating to see was the immense variation in both shape and colour that this wild population exhibited. There were flowers with highly pointed tepals, while some others were more rounded. Some were the classic 'goblet' shape. Although varying in intensity, from plant to plant, all flowers were bicoloured, i.e. yellowish orange in the middle, and darker orange on the rest of the flower. The intensity of the dark orange part was, again, very variable. We found light orange plants, as well as medium orange ones. We



The author and his friend, Hansjurg Albrecht, filming *Lilium bulbiferum*.

even encountered a fabulous flower which was almost deep red! In the wild *Lilium bulbiferum* does not grow very tall, and most of these plants varied from 20 to about 60 cm tall.

Alongside the *Lilium bulbiferum* we also found some *L. martagon*. They too varied greatly in flower colour, intensity and spotting. Some were in bud, while others had just started flowering.

Once the location of the different *L. bulbiferum* plants was established we set off to make the film. The clock was ticking and I mean this literally since Hansjurg, not having an actual wristwatch, had brought a large table clock with him to keep the time, which was ticking away in his pocket except when he looked at it, once in a while, to make sure we were not going to miss the bus!

By the time this article goes to print, the *bulbiferum* film will have been posted on the lily group website, so most readers will know what I am referring to when discussing the film in the following paragraph.

We started off by filming my introductory phrase to camera. Hansjurg had told me that this was a very remote place, so we could go about filming with no fear of being disturbed. However, two minutes later, as we were about to go for a take, a group of about 60 school children erupted into the meadow out of nowhere and were clearly fascinated by these two strange men in the middle of a field with a huge camera! (They turned out to be the same children who had been on the bus with us earlier!). Having done a few takes, of *Lilium bulbiferum*, we had a look for a good place to conduct the interview. We thought it would be good if the interview could be set close to a fairly large clump of the lilies. Unfortunately, the grass was still wet from the morning dew, so it was not possible to actually sit down on the grass next to the lilies. We did, however, find a rock to sit on, which was quite close to a large clump of lilies, so this is where we



*Lilium martagon* in the rays of the sun.

decided to film the interview. After a while a woman, whom we had met earlier on another bus, came walking by. She said she wanted to thank Hansjurg very much for telling her about the location of all these fantastic lilies.

Once the interview was finished we only had a few minutes left to film additional footage and take some more photographs of as many different forms of *L. bulbiferum* as possible. Time was passing, and we probably looked like two crazy chickens running around in a field! Hansjurg took out his big table clock and said “Pontus! We are going to miss the bus! We have to hurry!” so we quickly packed up and headed back to the bus stop. Fortunately, we got the bus in time and were on our way back. Hansjurg commented on the way back that it would probably never have been possible for me to cycle those 70km with all the camera gear, so it was lucky we found a bus!

Before I left, Hansjurg kindly gave me some bulbs of ‘Marhan’, as well as some *Sanguinaria canadensis* var. *flore pleno*, which was originally from Sir Peter’s garden (as he explains in the film), as well as some *Iris cristata* and two rare and unusual lilies of the valley, i.e. *Convallaria majalis* ‘Albostriata’, with white striped leaves, and *Convallaria majalis rosea*, the very sought after pink form.

Since then, we have been exchanging a lot of plants, large boxes of very exciting plants going from Losone to Geneva, and from Geneva to Losone, with ferns, *Colchicum*, *Sternbergia* and lily bulbs, just to name a few!

Given Hansjurg’s excellent strength and health, I’m sure he still has many years of gardening in front of him and many more years to go and see the *Lilium bulbiferum*. It is to be hoped that they will remain untouched in this remote alpine valley for many more years, tucked away, like little treasures under the thick snow cover in winter, and erupting again in spring, to keep company with the salvias, marguerites, aquilegias and other mountain plants in the meadow.





## Growing lilies in Guatemala

*Mary Belle Frey grows lilies on the slopes of a Guatemalan volcano. To learn more about this exotic and potentially dangerous pursuit, read on.*

My first experience with a lily in Guatemala began when a neighbour's son showed me six 'dientes' (teeth) of a lily that someone had given him. I said immediately, "You aren't going to know what to do with those. Give them to me and I'll give you three bulbs when they're ready and keep three for myself." A year and a half later my three bulbs gave me 17 blooms. It was a white trumpet (which I now know to be *L. formosanum*) called 'la extranjera', the foreigner, to distinguish it from 'la criolla', the native, a very old clone of *L. longiflorum*. Both are much prized in the cut-flower market of Guatemala.

Those three bulbs along with some modern hybrid lillies I brought from the U.S.A. disappeared into other gardens when I began to travel with my business. But I promised myself some day to have lilies again, preferably behind a high garden wall.

My walled garden is located in a rural community near Antigua Guatemala on the north slope of the volcano Agua at 1700m altitude and 15° N latitude (Manila, Phillipines and Yemen are also at about 15° N latitude). The volcano Agua is one



**Above, Some Division VI hybrids. Right, *Lilium longiflorum* with very lush foliage.**

of the chain of volcanoes that surrounds the Pacific Ocean. In Guatemala there is a narrow strip of coastal plain on the Pacific Ocean then the line of volcanoes and behind the volcanoes ranges of high mountains. These mountains slope down toward the Caribbean Sea and a large coastal plain. Within Guatemala there are many climates, from deserts to tropical rainforests, from steamy jungles at low altitudes to typical pine and oak forests at high altitudes. Most of the country has a very dry season during the northern winter and heavy rains during the northern summer. Our coldest weather comes straight from the Arctic down the North American central plain and across the Gulf of Mexico. Temperatures depend on altitude, so the high central mountain areas produce apples and pears, the Pacific coastal strip, sugar cane and cotton, the Caribbean lowlands where there is more winter rain, bananas and the intermediate areas, coffee, avocados, vegetables, and flowers. There are varieties of maize for every climate: from a soft grain in the hottest areas to a hard grain that takes twelve months to mature in the highest fields on our volcano.

My village is surrounded by coffee plantations. The soil is a poor volcanic sand, though high in potassium. The fruit that is removed from around the coffee bean makes a rich compost which we add in large quantities to our sand and pebbles (soil).

In this improved soil the 'criolla' lily (a *L. longiflorum* clone) grows over a meter tall with normally a dozen or more flowers, whereas in the field it is much

lower with four or five flowers. I call this a clone because I cannot get it to set seed with pollen from any *L. longiflorum* sold in the market as cut stems. As soon as I had flowering plants from imported seed the 'criolla' set full pods with no help from me. The offspring is wonderfully varied, in height, flower size, and form, some with thick, lush foliage and others with a sparse, nearly erect foliage like the 'criolla'. The 'criolla' is resistant to botrytis and most of the offspring inherit its resistance. I understand that basal rot is a problem with the named clones in gardens, but I have lost no plants to rot, even though they are dormant during the period of heaviest rains. Those lilies with lush foliage tend to wilt in the mid-day sun, but frequent watering in the dry season led to an epidemic of botrytis which took several years to control. In the dry season now I water the lily beds at most every three weeks. The lush foliaged *L. longiflorum* wilts in the sun but manages to flower well and increase anyway. As I acquire seed from other sources I will introduce new genes. To date I have culled only the most botrytis-prone and those with small, narrow flowers.

I no longer grow the local *L. formosanum*; it is very tall and generally of poor substance. *Lilium formosanum* (type) with purple reverse was the star of my garden last year. There are a few plants with blooms most of the year but the heaviest bloom is in August and September.

*Lilium candidum* grows wonderfully at somewhat higher altitudes than my garden where it is planted among peach trees and where the soil never totally loses its moisture. It does best (but not very well) in my garden on the north side of the house where it gets shade during the dry season and sun during the rainy season when the sun moves to the north of us. In April at the end of the dry season when the sun is at the zenith and very strong *L. candidum* needs some artificial shade because the bulbs are right at or on the surface. However, if the shade is not removed when it begins to rain, it forms bulbs up in the air at the end of a short stalk.

At this altitude there is no frost and I have never seen the thermometer go above 27°C. The temperature of soil in the shade ranges between 17°C and 21°C. It would be logical to try to grow the lilies from the most southern parts of Asia, where the climate is similar to ours. However, when seed of these lilies is offered, it goes to people who live closer to the seed exchange chairman. For that reason I have grown the more common species and trumpet hybrids. There is no possibility of vernalization and yet all the lilies grow well and flower. The trumpet hybrids and *L. henryi* pay little attention to the calendar: there are stalks at all stages of growth every month of the year. Other species that have flowered here without vernalization include *LL. leucanthum*, *regale*, *sargentiae* (which three are permanent), and *LL. concolor*, *pumilum*, and *wardii*. Only *L. wardii* came to me as a bulb (from the Species Lily Preservation Group); it

flowered twice but was never happy and disappeared in its fourth year. Other bulbs from North America failed to emerge in their second year. I am told that the Asiatic lilies that are sold as flowering plants in pots when planted into our gardens do not flower again. Of course, we are told that all these lilies need vernalization. My experience is that a bulb which has not had a cold period in its first year will not require a cold period to break dormancy. Other Asiatic species grown from seed have emerged after dormancy, but succumbed to the fierce April sun and/or to the activity of kittens. You will note that the species that are permanent with me are all large bulbs and send up a strong shoot that resists the sun. I have had wire cages made to protect



An *L. longiflorum* plant,  
1.6 metres tall.

the seedling Asiatic species and hybrids when they go into the ground. The plan is to attach shade cloth to the cages in the spring until the rains begin in May.

Insects do not pose a problem in our gardens. We have many kinds but generally there are only a few of one kind, as they have the whole year in which to reproduce. Around my village there are greenhouses that raise tomatoes for export and when they are fumigated, our gardens fill up with white fly. I wash them off the lilies with a detergent solution.

This climate is a paradise for fungi. I no longer plant lily seed in the rainy season but wait until autumn when the rains have ceased. I had never seen botrytis on the lilies until after I acquired the *L. longiflorum* from seed of named clones which had to be watered every other day during the dry season. With the beginning of the following rains some beds of lilies were decimated by botrytis. It can be a problem in the dry season as well because we have heavy dews. Botrytis attacks the emerging shoots at all seasons. I learned to control botrytis with sodium bicarbonate sprays every four days in the dry season. It was very interesting to see some plants covered with botrytis and a neighbour, perhaps a sibling, completely clean. I now destroy any seedling that is susceptible. Last year's rainy season was very wet: we had perhaps eight days without rain in the whole five months. I sprayed the entire garden with a bicarbonate solution a few times and in spots when there were occasional signs of botrytis. I consider botrytis no longer to be a problem though it is clearly present. The Asiatic and *L. auratum* hybrids sold in pots here always have a heavy accumulation of

copper sprays on the leaves.

My plans for the future are quite general. I will add species as I acquire seed, confident that I can succeed with naturally large bulbs and still experimenting with the naturally smaller ones. I am testing soil mixes for pot culture to give more flexibility as to sun/shade and amount of rain. I aim to try seed of an individual species from many sources as I have already observed that a species from seed from different parts of the world can vary greatly in vigour and adaptability. I expect I will make controlled crosses within a species as I am already doing with *L. longiflorum* and will soon be in a position to do with *L. henryi*. I will continue to add new hybrids from seed also and be more selective now that I have a nice collection. I dream of great beds of American species and *L. monadelphum*, but these must wait till I can manage the sun and moisture better. I am only 73, so I have lots of time.

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## Catching the light: the joys of digital photography

*In this article **Kathleen Mingl** enthuses about and provides practical guidance on the use of digital photography for capturing beautiful images of lilies.*

*Larkspur and hollyhock, pink rose and purple stock,  
Lovely-smelling mignonette, lilies not quite opened yet–  
Phlox the favorite of bees; bleeding-heart and peonies...*

(Dorothy Aldis, "Names")

I love all kinds of flowers, but some are "close to my heart" for reasons of my own: snowdrops to show that winter can't last forever, daffodils so I'll know it's spring; roses and phlox for the scent of summers gone by, and of course, lilies—because no matter what the season, in seed, leaf, bud, bulb or bloom, there's always something new and interesting going on! Since I've become involved in hybridizing I hate to cut potential seed-parents for bouquets, so photographing them instead lets me have my lilies and cross them, too.

No matter what their shape, lily blooms seem to me to be perfectly constructed for holding light, their large, curved petals and cupped nectaries concentrating it exactly where they want hungry pollinators to look. (Since human admirers propagate lilies too, this is just good survival technique!) Whenever my lilies are up and the light seems just right, I'm known to grab my camera and dash out



**Top, from left to right and below,** photographs were taken with a basic digital camera, a mid-range digital camera and a top of the range digital camera.

with no warning at all, to “catch it” before it changes—gold-edged mornings with the dew soaking through my socks; rosy, hot afternoons with deep shadows (for practically-neon backlit shots), and my very favorite time of day, that perfect

half-hour before sunset when everything glows with “storybook colours”. Even before the lily blooms begin, the patterns of the unfolding leaves and buds are colorful and fascinating, and I try to photograph them at every stage—to study, keep records of their growth, and just because they’re beautiful.

### **The digital advantage**

I dearly loved my Minolta film-camera with its wonderful lenses, but when I started experimenting with close-ups and different effects, it did get expensive! I’d heard that professional photographers sometimes take a dozen or more shots just to get the “good one”, but having my film developed at the supermarket meant that I had to compromise or go broke. With a digital camera, on the other hand, when you see the possibility of a picture in something you can take shot after shot until you get just the one you envisioned, deleting all wrongness and error at your leisure. My Olympus “Camedia” C-730 (10x Optical) “Ultra-Zoom” is a nice light little gadget, about mid-range at 3.2 mega-pixels<sup>1</sup>; not the cheapest or most expensive model when it came out, but still bristling with more features than I’ll probably ever need. I was doubtful when the guys gave it to me for Mother’s Day a few years ago, but now I really can’t remember how I ever got along without it!

Many people who can afford the price of a digital camera are intimidated by all the technical options and “competitive market” features (not to mention the manual, which is lucky if it ever makes it out of the box)—but it isn’t that much harder to learn to operate than a fancy microwave oven. You don’t even have to own a computer to use one; you could just slip out the little memory-card thingie it records images on and take it to your grocery store, just like you would a film cassette. Places like Walgreen’s and Wal-Mart (American supermarkets) have do-it-yourself terminals where you can view, adjust and print your images instantly, at a considerable savings over processing negatives. (Mind you, not having a photo-editing program to play with means you’d be missing out on half the fun, but paper photos are nice to have, too—for showing off your “grandlilies,” as Art Evans would say. You can buy photo-paper and special little printers just for making “hardcopies” of the pictures you want to keep, or insert the memory-card into the proper slot of many of the regular printers for home or commercial use.

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<sup>1</sup> “Pixels” are bits of electronic data arranged in a grid like a screen. “Mega” means “million,” so that gives you ...lots and lots of little bits of data. The more data the bigger the image, so while you could make up to 16 x 20-inch prints (or concentrated into any smaller size but with greater detail - referred to as “high resolution”) from the images in my little camera, with the “big ones” you could do posters.

## **You and your new toy**

Let's assume that you have just given in to impulse and bought yourself a shiny new digital camera, and are now considering all of its screens and dials and buttons and wondering what to do next. The first thing you should locate is the "quick-start" picture sheet, which nearly all devices more complicated than a toaster come with nowadays. This will show all of the parts and basic procedures, with numbered instructions for easy set-up. Then, once you've tried your new toy out, taken some pictures and learned how to erase or transfer them to the computer, you may find that you'd now like to learn more. At this point you will actually *want* to consult the inner mysteries of the manual, so keep it handy in the box with the receipt, warranty and all the bits and pieces of packaging. Some hands-on familiarity with the real object works wonders when you're trying to make sense of all of those menu options.

So now, what do you take pictures of? Oh boy, everything! Experiment with all kinds of lights, angles, and subjects, from moonscapes to rainbow-reflections in the sink to really nosy close-ups (my camera has a super-macro setting that in a good light can photograph a bug's whiskers, as long as the darned thing holds still!) Self-restraint to save film is a frustration of the past; even at super-high-quality size, you can get 70-some shots on one thumb-sized 128Mb memory-card, and unless you're out and about you can always download to your computer and go back out for more. (You can buy extra memory-cards in various capacities—besides the 128Mb I have two smaller cards for backups, but only once have I filled them up completely. A 256Mb would be just about right, I think—for everything except perhaps a NALS show! Photography expert Frans Officer recommends a minimum camera card of 512Mb: "It's ALWAYS better to have room left over on the card when you're done, rather than be one photo short," says Frans.)

Keep good batteries in your camera and an extra set in your pack (rechargeables are relatively expensive, but come out cheaper in the long run if you use them a lot), but use an A/C adapter whenever you can at home—mine is connected to the power-strip by my desk, and I hang a long, heavy-duty extension-cord out next to the lily bed during the blooming season, ready to plug into the outlet by the door whenever I take the camera out.

If you're field-hopping and not sure your batteries will last all the way through the tour (your own or the camera's)—you may have the option of turning off the display screen and using just the regular viewfinder instead to conserve power. If so, remember to leave more room at the top of the picture the closer you are to your subject—we've all done the "headless relatives" thing with the old vacation film-camera, so you don't want to do it to your lily subjects:-) Digital cameras come in costlier SLR (single-lens reflex) models just as film cameras do, but they use a different method of through-the-lens focusing, electronic rather than mechanical.





### **Focus and depth of field**

Instead of messing with light-sensitive chemicals on film, digital photo-sensors work by recording variations of light directly as patterns of electronic data—the more light (up to a point), the more data. Bright light gives fine detail and quick auto-focus, so you don't have to worry about holding the camera still for very long to get a clear picture. The built-in lens on most compact “point-and-shoot” digital cameras (we're not talking about the expensive professional models here, where the lens can cost as much as the camera and the sticker-shock leaves you woozy!) is relatively short, the auto settings good for garden or landscape shots where *everything* is more or less equally sharp and clear (including weeds and things you don't want in the background, so watch it!). In camera talk, this is referred to as a “greater depth-of-field.”

For the close-up settings (portrait, macro and super-macro), the effective focal-length is increased and depth-of-field reduced<sup>2</sup>, all the way down to the point where a tilted subject like seeds scattered across a sheet of paper on a desk will have only the exact seed you're aiming at in focus, and that only if you use a tripod or steady the camera on something while you shoot. I use the regular macro-setting most often; it gives nice close detail and a softened background to emphasize your subject.

### **When the lights are low**

As anyone knows who has tried available-light photography without resorting to the flash, the lower the intensity of light the longer the camera—and subject—have to stay still or your image will be a blur. You can turn on the flash and get a

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<sup>2</sup> The definition for “Depth of Field” that Frans Officer uses in his talks on photography is, “The area in front of the lens, stretching away from the camera, that will be ‘sharp’ or ‘in focus’ in a photo. This area can be manipulated by the photographer to be smaller or larger.” etc. Wikipedia also has lots more on the whole subject than you'll ever want to know at: [http://en.wikipedia.org/wiki/Depth\\_of\\_field](http://en.wikipedia.org/wiki/Depth_of_field)



***Above and opposite from left to right,***

These photographs demonstrate the qualities of digital photography under different natural lighting conditions:

1. 'Anaconda Strain', bright morning light 2.08Mb.
2. Oriental 'Casablanca', morning light 487Kb.
3. *Lilium speciosum* 'Uchida', morning 1Mb.
4. *Lilium speciosum* 'Uchida', overcast 893Kb.
5. 'Hal's Best' Trumpet, afternoon backlit 1.51Mb.

clear picture, but the problem is that low light, soft focus, and even blurring in the right places—like on the wings of a butterfly—give a scene character and interest, and can convey much more of the feeling of the moment you're trying to capture than the painfully flat, show-the-world-your-wrinkles, hard focus of a flash photo. The beauty of these clever little devices with their automatic electronic sensors is that they don't get in the way of serendipity: effects that you could accomplish in regular photography with special high-speed film, studio-lighting, and lots of clear, reasoned thought, you can manage spontaneously with your digital camera, just by bracing it against a chair-back and holding your breath. (Reasoned thought is good, too; it's just that it's so often afterthought. We'll talk about photo-editing later.)

Most often when I need to do a quick photographic study of a test-tube or sample of seeds, I get good results by holding it directly under the 60w energy-saving lamp on my desk—though I always try to take several shots of each angle and pick out the clearest ones. (If the subject is at all forward from the light it comes out orange, or half orange and half blue nearer to the computer monitor, which can actually be quite pretty. You can also get some interesting results by deliberately putting a particular image up on the screen and using it to light your subject). In other experiments, I've caught some astonishing "ephemeral art" and wild abstract effects by the light coming through colored glass bottles in the

kitchen window, falling on a vase of flowers on the counter below. Being able to photograph such fleeting phenomena seems to open your mind up to seeing them; so many more little details to things that you'd never noticed before, that it's like discovering a whole new world on your desktop! In his *Mastering Digital Photography*, "Close-ups Up Close," author David D. Busch says that it's an infectious pursuit, and tends to become a way of life to anyone who tries it seriously.

When you do have time to get properly set up and you're photographing a subject that stays put, a light, sturdy tripod for your digital camera is a necessity and a joy. Indoor displays like those at lily shows, art compositions on the kitchen table, as well as family reunions and Christmas-card photos around the tree, all benefit from careful lighting and unhurried, un-jiggled focus. Indoor lights are orange-tinted, window-light blue, fluorescent lights greenish or purple. (Photos from our Lily-Day events at the CASEE building often combine all three, depending on where you're standing—to the considerable confusion of those busy little automatic sensors!). Experts say that when they photograph shows, they not only use a tripod but also bring along a neutral-colored background board to set up behind the displays.

### **Outdoor studies**

Outdoors, mounting your camera on an easily-carried tripod can give you lovely, clear twilight-shots, or magazine-quality portraits in daylight—on a still day with no helpful cats about. Butterfly-chasing is made more difficult, but Eddie McRae relates that a friend of his in the early days used to catch the butterflies, fold them carefully in a piece of paper, and place them in the refrigerator for at least half an hour, so that when placed on a flower, it would take them several minutes to wake up while their picture was being taken. ("I've tried this method and it works perfectly!" says Eddie.)

I like a clear morning light best for photographing lilies, with a few slants of sunbeams among the petals to give dimension and interesting shadows. Back-lighting is exciting to play with, though the colours tend to be hot and wildly fluorescent (even the blues and purples of delphiniums, which are gorgeous with lilies.) One of my favorite effects combines a dark background with a bright little glow right in the lily's heart, but if you don't have the camera in your hand and have to run and fetch it, the light will probably have moved by the time you come back. Just note the time and try to be there ready for it the next day. That's how the Master Impressionists painted their art of pure light; in 20 or 30 minute sessions at the same time each day. Nowadays, artists are as likely to use digital images to paint from.

A bright, overcast day is considered best for making a record of your lilies'

true colours, but you'll need to experiment. There are various helpful exposure-control settings you can use to compensate for different conditions, though you may have to resort to consulting the instructions—or the searchable CD-manual—to find them all. At least you don't have to worry about using up film while you study the problem. (Here's a secret that it took me a while to believe myself: while you can ruin your camera—not to mention void the warranty—by doing something unfriendly like throwing it at the wall, you can't harm anything by wandering through the menu, poking buttons and experimenting with the settings. I'm still finding out new things about mine, but I didn't learn a thing when I was afraid to touch!)

### **Millions and billions of colours**

Photography has definitely come a long way in its 160-some years, but though digital technology is a marvelous advance, no one claims it's perfect. (Lucky thing for all those writers of “how-to” books!) Colour reproduction is a particularly involved subject—shelves full of books have been written about it, but suffice it to say that at this point in the game every system and device used to capture and display colour—cameras, monitors, scanners, printers or whatever—is going to give different colour results. I've had two digital cameras to compare now (my last one didn't take well to my computer system upgrade), and while my present one gets more detail with lower light levels, it doesn't do so well with red and orange tones in bright light. (There are undoubtedly more adjustments I haven't tried, but others I've talked to have reported the same sort of thing, or that their new toy did better.) I did notice that the green leaves always look great, so it made sense when I read that digital cameras in general are designed with twice as many green sensors as red and blue ones. (Presumably this is because our eyes are designed that way as well, but even million-dollar devices can't approach the sensitivity of our natural equipment.) Still, more sensors would mean more gradual, subtle tones in all hues, so it's logical that the higher-quality models would do a superior job. If you can afford it, do yourself a favour—don't worry about buying a “cheapie” digital camera to learn on just because it looks simpler; buy the best you can and learn on that.

### **Photo-correction and art**

As far as I know, all computers come with some form of imaging features for basic things like straightening, tiling and re-sizing for e-mail, but you'll probably want a program that gives you more control over the finished picture. You can

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<sup>1</sup> The term “photoshopping” is fast becoming part of the language for any digital manipulation process, to the perplexity of copyrighters.

buy software from computer or electronics stores, variety stores, large bookstores, or find it on the Internet: Amazon, eBay, or individual company sites like adobe.com. They range from expensive to free, so you'll want to comparison-shop. Photoshop is indisputably the industry standard<sup>3</sup>, designed to be a "digital darkroom," for doing absolutely anything you need to do to an image. I have it because my son works with it and can advise me if I need help; it's not cheap (except to students) and it's not simple, but it's awesome, elegant and powerful, especially the latest versions, CS2 and CS3—not just a tool, but a whole "shop" full of them. There are programs that cost less and are considered easier to learn: Paintshop Pro was one I had an early version of at one time and liked very much; Photoshop Elements seems designed as a beginner's Photoshop, free with some scanners, etc. These and others, including Photoshop, are available online as free 30-day-trial downloads so you can try several and see which one you want to keep.

There seems to be a certain feeling—perhaps originated by professional photographers—that fixing up errors in your digital images after you take them is somehow cheating. How you look at it pretty much depends on what you want to show off, your own skill or the subject of your photo. Certainly, for a scientific record of the effects of pests on buds and flowers, you would want to preserve every ragged edge and hole, and even sharpen and lighten the image if necessary so the phenomena are more clearly visible. For a catalogue picture or a magazine illustration, you would want the image to reflect the ideal beauty of the flower, not some incidental chomp taken by a wandering bug. For your own purposes, do whatever makes you happy—but always keep copies of your originals, preferably on a separate CD or DVD. (There are a number of good reasons for doing this, the most obvious being the backup of files in case of accidental deletions or hard-drive crashes. Another is that as your skills and interests evolve and the technology improves, you are likely to find that you can now do things with what you thought were "failed shots" that you never thought possible.)

A digital camera is an amazing little computer in itself, but "hooking it up to the big one" and using a good graphics program on your photos gives an entirely new dimension to the game. You can zoom an image all the way up to a pattern of squares like cross-stitch designs, and manipulate them pixel by pixel (like Seurat's "Pointillism" paintings, where dots of pure colours placed next to each other create different shades and hues when viewed from across the room.) You can lighten the entire picture or just the dark corners, improve or soften focus, move or remove unwanted details, and erase dust spots like magic. You can even combine pieces of different pictures to make an entirely new picture, or create artistic effects such as brushstrokes or shimmering "watercolours." There

are books, tutorials, discussion websites, and all sorts of enthusiasm and help available.

The advantages and possibilities of digital photography go way beyond the money you save by not having to buy and develop chemical-based film negatives and slides (which incidentally, can begin to degrade in as little as five years), just as there are more reasons to grow your own lilies from seed or embryo-culture than simply “not having to ever buy another bulb(!)” You hybridize and raise your own for the enjoyment and satisfaction of it, to create unique, healthy lilies for yourself and others, perhaps as a business, but always to learn and advance the game. Learning to use a digital camera is also an adventure into territory that once was the province of experts, but is now open to all. You may or may not be able to make money with it—you almost certainly won’t save any, with all the wonderful books, programs and peripherals available!—and no matter how good you get at it, you’ll never be satisfied because there’s always more to learn. Some would call that an obsession—but then, they’d say that about lilies, too!

### References

David D. Busch is a professional photographer and author of 90-some books and literally thousands of articles on photography and computer technology – he combines an “all-meat” approach to weighty technical subjects with a light and friendly touch. (He also wrote one called *Sorry About the Explosion*, a book of computer humor.)

*Mastering Digital Photography*, 2nd Edition (Thomson Course Technology, amazon.com)—for those who wish to move up to the next level of digital photography, knowing your tools and actually thinking about the result you want before taking the picture! The huge illustrated glossary of photographic and technical terms is a book in itself.

*Adobe Photoshop CS2: Photographer’s Guide* (Thomson Course Technology, amazon.com) “Your dream guide to pixel proficiency.” Busch won my heart in the introduction, by including in a list of things you can do easily with Photoshop: “Excise your obnoxious ex-relative from a family reunion photo without resorting to violence!” There are many good books written about using Photoshop, but this one is written from a photographer’s point of view.

### Digital Camera Reviews

[www.dpreview.com](http://www.dpreview.com)

Digital Photography Review—gorgeous sample galleries showing photos taken with each model.

[www.cnet.com](http://www.cnet.com)

News and reviews of all sorts of technical stuff, including laptop computers, printers, software, digital cameras, etc. - many written by David D. Busch.

### Footnote

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# The Ryrube Group



A golden Ryrube sibling, a.k.a. 95-8-108.

*In this article, **Joe Hoell** describes the origin of an attractive group of hybrid lilies and how he has contributed to their development.*

## **In the beginning:**

The Ryrube Group of Orienpet Hybrids were developed and later registered by Mr Ted Alexander of Christchurch, New Zealand. They were first hybridised in 1989 and registered as a strain in 1995.

## **VIII Ryrube Group**

**Parentage:** 'Canterbury Belle' x (*L.henryi* x an apricot trumpet)

**Hybridizer:** H:(1989) & G:(1982): A.E.Alexander N:,I:&Reg:1995.

**Description:** *Inside ranging from white or cream to orange, with orange or green throats; outside ranging from cream shaded with pink, green and gold, white shaded with green and pink to clear orange; unspotted; nectaries green; pollen from orange to brown. Fls 120-180mm wide, out- or down-facing; petals 70-100 x up to 40mm, margins not ruffled, tips slightly recurved. Lvs alternate, up to 200 x 30mm, mid to dark green. Stems 1.5-2.4m, dark green, mottled, with 8-16 fls. January (New Zealand). Fls have a heavy texture and are long-lasting.*

Source:

RHS Supplement 14. Last modified on 29 July 2006 by Gerry Danen. LR entry #6835

Mr Ted Alexander used a cross of *Lilium henryi* x Orange Trumpet lily as the Pod Parent, and the Pollen Parent consisted of a cross between *Lilium rubellum* x Cream/Beige Aurelian, which was made by the late Mr Bill McClaren. The pairing



008-72-1.



14\_96-8-44.

produced viable seed from which Mr Alexander raised 15 seedlings. These seedlings were mostly coloured white/green, some having the first faint hint of pink, with the bud shape of these seedlings being very good.

My part in the Ryrube story began in 1992, when I was invited by the New Zealand Lily Society Inc. to judge their 60th Anniversary Show. I was invited to stay with Mr Ted Alexander for a while in Christchurch and we have corresponded and kept in touch since. Later on, Mr Alexander forwarded some Ryrube seed and pollen to me.

I was very interested in the late Mr Robert Moriarty's Canterbury Strain of Trumpet lilies and eventually I received some seed and pollen from Mr Bob McClaren and later I incorporated some into my Ryrube Strain.

#### **Now enter Mr Joe Hoell:**

My breeding records show that 1995 was the year my first Ryrube Hybrid babies were born. They were the result of Mr. Alexander's pollen and some of his seed. This batch consisted of seed from my first crosses and three seed lots from Mr Alexander. From these, some flowered in their second year and were fast growers, performing better than my other hybrids which had species forming the major part of their genome (genetic material).

I have incorporated the following into their breeding:-

- 82-111
- *Lilium speciosum*
- *Lilium auratum*
- Double infusion of *Lilium rubellum*
- Canterbury Trumpet Hybrids



I have even added *Lilium nobilissimum* through (Taj Mahal x (T.W.T. X 82-111)), a 4N cross of mine which has proven to be extremely fertile. *Lilium* 'Trance' and *L.* 'LeReeve' are also included in my Ryrube Strain's genome. I have also created very nice clones by using *Lilium* 'Midnight' genes in my crosses. As a result of this complex breeding program, I have achieved a full spectrum of colours with my Ryrubes, accepting a true blue.

This year has seen the first of my seedlings flower from the crossing of my Ryrube Strain with Dr. Robert Griesbach's Orienpet Strain. The results thus far with this combination of genes has been superb.

My Ryrubes are all very vigorous in growth and are both *Botrytris* and *Fusarium* resistant. They appear to be virus resistant, or at least very tolerant. As a result, the gene pool has proven to produce very reliable and robust garden lilies that will persist well in most garden environments.



65\_96-8-126.



Joe Hoell\_0093.

### **Breeding better garden lilies:**

I don't use any fungicides or insecticides at all. If you want to breed 'Garden Lilies', then breed them for Hardiness, with minimal fertiliser requirements. Remember, lilies in nature don't receive much in the way of fertiliser at all. Some people claim that lilies are heavy feeders. This is definitely not the case! Lilies love a lot of humus, organic matter, and if this mix includes leaves from trees that have deep root runs, then they will get all the minerals and trace elements they need.

I deliberately keep virused lilies in my garden. How else am I to know if the lilies I breed are virus resistant? You can get viruses intolerant lilies from just about any of the selections supplied by commercial cut flower industry, with the Orientals being the first to be infected with virus in any garden.

### **Acknowledgements**

Many thanks to Mr Ted Alexander for supplying dates, details and information on Mr Bill McClaren.



Eddie (Ed) McRae  
and Judith Freeman  
among lilies at Lava  
Nurseries.

## Edward Austin McRae (1932-2008)

*In the following tribute, **Peter Schenk** reflects on his memories of Eddie McRae over 40 years of friendship and discussion about lilies.*

I first met Eddie in May of 1967, when I joined Oregon Bulb Farms for a year of practical study in lily hybridising. Eddie was then the director of hybridising (replacing Earl Hornback, who had died the year before), and in that time Eddie and I worked almost daily together.

Eddie gave me a lot of freedom, and for me it was a great opportunity to learn all about lily breeding. The many beautiful strains such as 'Imperial', 'Pink Glory' and 'Jamboree', etc. (as well as the 'Pink Perfection', 'Golden Splendor', 'Moonlight' and the 'First Love' trumpet strains), were all propagated from seed, so a very big part of our work at OBF was the maintenance and the improvement of all the strains—selecting the superior mother plants in the blocks of similar seedlings and making trial crosses. We tried to get qualities like better colour, uniformity, vigour and disease-tolerance into the seedlings. Many times we discussed the possibilities of selecting plants out of the strains to clone them, but Eddie preferred to propagate his lilies from seed for this was cheap, fast and every year gave a virus-free start.

At this time Eddie was also working on creating Mid-Century varieties (the basis for what are now called 'Asiatics'), in new and better colours, such as 'Pirate', 'Chinook', 'Pepper', 'Sterling Star', and 'Firecracker', and in breeding with the dwarf Oriental 'Little Rascals' strain. Eddie was a pioneer in breeding pot lilies, and even though we both knew this market was smaller than that of cut flowers, it was he who made me enthusiastic in breeding them as well. Eddie had a difficult time during what is known as the 'Melridge period' at OBF (after 1975, when the company was sold to the Joe Berger Company and joined with

the competitor Sun Valley Bulb Farms in California). The company became bigger and bigger; there were many changes in staff and personnel, and the Dutch influence brought a very commercial approach towards introducing new lily varieties. It was very stressful for Eddie, as a hybridiser cannot be changing his goals all the time, but still in this period he was successful in introducing a series of very good yellow-flowering Asiatics which gave a new stimulus to the Dutch lily-bulb and lily cut flower market: 'Pollyanna', 'Adelina', 'Dreamland' and 'Yellow Giant' are all still grown in Holland! He also introduced many pot lily varieties, including the well-known 'Pixies'; the best-known, 'Orange Pixie', was grown on 50 acres in Holland in 2008.

After I left OBF I visited Eddie many times when 'his' seedlings were in flower. We walked through the fields on many days and discussed a lot of lily-related things and exchanged information. At that time I was working as a county agent in Aalsmeer (specialising in lily flower forcing), so we had a lot to talk about. We also started communicating by writing each other letters very frequently. I still have all of his letters, many handwritten and difficult to read (more than 150 of them!) in my possession. When I started as a lily breeder at Bischoff Tulleken Lilies (BT) in 1977 we also began to exchange breeding material.

When I visited Eddie I first stayed in his apartment at OBF and later, after Eddie's marriage to Judith Freeman, in their house on Bluff Road. I remember those visits very well; we talked about lilies from dawn till dusk, and there was lily material lying or hanging everywhere in their house. Their backyard looked like a testing field of lily varieties, and I got the idea that their kitchen was mainly used for embryo culture! Judith also worked at that time for OBF and was even more enthusiastic than Eddie. She helped him to get organized and supported him a lot, especially with breeding material which needed laboratory work.

I also visited Eddie at his house in Sandy, and he also visited me several times in Holland. In Holland, I showed him around and we visited most of the lily breeders. He was amazed at the scale of lily breeding. It was difficult for him to understand the very commercial approach of the Dutch lily-breeding companies.

Eddie was active for several years at the Van der Salm company in Woodland, Washington (where he had the pleasure of working with his daughter, Catherine). This was quite a change for Eddie, as he was working on OTs, LAs and tetraploid Asiatics. It was here that he created another eye-catcher, 'Golden Stargazer' [the first successful cross between an Oriental and a *henryi* hybrid-JM]. He also became more and more involved with the Species Lily Preservation Group, of the North American Lily Society, producing species lily seeds and bulbs at his fields at Lava Nurseries. I visited him there several times, and was impressed by the large scale of this operation.

Altogether, Eddie and I were in contact for almost 40 years, sometimes more frequently (as when I had the privilege to co-operate with him on the writing of his lily book, *A Guide for Growers and Collectors*) and sometimes less frequently, but always it was lilies that we had in common. In the last couple of years we kept corresponding, and though his last, handwritten letters were very difficult to read, the news of his death shocked me, because I was not aware that his situation was so bad. My thoughts go to his family, and I hope they find comfort remembering Eddie as an internationally known lily hybridiser who made the world more beautiful with all his lily creations.

I have many good memories of the time Eddie and I were acquainted. I learned a great deal from him, and I am very grateful. I used his lily material for my breeding programs, so in all of his and my lilies I see his work. I owe him a lot.

With the passing of Eddie McRae, I lost a good friend and we all lost a great lily breeder.



The author with stems of *Lilium polyphyllum* in their natural habitat.

## ***Lilium polyphyllum*** **– rarest of rare lilies**

*Lilium polyphyllum is the mysterious member of the candidum group that lives in geographic isolation from the other members of its group. In this article **Anurag Dhyani** shares his research findings in relation to the conservation of this lily and its use in Ayurvedic medicine.*

Lilies are among the most beautiful, fascinating and interesting of garden plants, as well as being an important floriculture crop for commercial purposes. They



Images of *Lilium polyphyllum*, past and present.

are ornamental and stylish in their cut-flower beauty, perhaps more so than any other herbaceous genus. Most *Lilium* species are distributed throughout the northern hemisphere of the world. India, a country rich in biodiversity, is, however, home to several lilies, most of which are in the north of the country (with the exception of *Lilium neilgherrense*, which is found in southern India) including the beautiful *Lilium polyphyllum*, a striking lily—that is found in the wilds of Garhwal Himalaya of Uttarakhand—with splendid pendant flowers and bulbs that are prized for their medicinal properties. Dr Royle discovered the lily one and half centuries ago and it has not been studied scientifically until recently—despite its endangered status. As a research student, at the High Altitude Plant Physiology Research Centre, Srinagar Garhwal, Uttarakhand, I have been working with *Lilium polyphyllum* (since January 2006) with the aim of assisting with its conservation. The following information is intended to provide an insight into the history of *Lilium polyphyllum* and my experience of working with this very rare plant.

### **Brief History**

Dr Royle discovered *Lilium polyphyllum* first in 1839 at Taranda, which is in the province of Kanawur. In 1871, the species first flowered at the Royal Botanic Garden Edinburgh having been raised from seed, sent from Shimla under the name *Fritillaria polyphylla*, by the Curator Mr Mac Nab. Mr G. Maw was the first person, in England, to flower this lily in 1873. Mr Barr described its natural habitat, in *The Garden*, 24 January 1874, thus: “it grows in good, tolerably moist vegetable mould, on slopes, under thick shrubbery and flowers in June at 6,500

Close up view of  
*Lilium polyphyllum*.



feet elevation.” Even 38 years after its discovery, no photograph existed to reveal its beauty. Then, in 1877-80, Henry John Elwes included *Lilium polyphyllum* in his seminal publication, *A Monograph of the Genus Lilium*. In 1880 *Lilium polyphyllum* received a first class certificate from the Royal Horticulture Society.

Seventy years after its discovery Mr G.F. Wilson, in 1901, reflected on his experience regarding the growing and propagation of *Lilium polyphyllum* as follows, “we had not yet quite mastered the treatment of this lily.” Several lily lovers hunted the wilds to acquire the trophy of its flowers for their photographic album and its bulbs for their gardens. Elgin T. Gates was one of the fortunate lily enthusiasts who found it in the Northern region of Pakistan at an elevation of 10,000 feet above sea level in the Hunza valley and described his expedition in the North American Lily Society yearbook of 1961. In his article he states, “I firmly believe the only propagation of this plant is from seed.” In 1974 a correspondent of Mr Barr, from India, wrote, when he observed *Lilium polyphyllum* in nature, “it grows in good tolerably moist vegetable mould on a slope in thick shrubbery and flowers here in June, at an elevation of 2100m”.

In 2006, the author selected *Lilium polyphyllum* as the subject of his Ph.D. degree. He did this under the guidance of Prof. M.C.Nautiyal (an expert on medicinal and aromatic plant propagation and conservation) and Dr. B.P. Nautiyal (expert ecologist and trekker). After one year of research into *Lilium polyphyllum*, I received the *Alice J. Murphy Award* from the International Society of Tropical Ecology for developing propagation protocols (seed germination, vegetative propagation, and tissue culture) and identifying conservation threats with further strategies to conserve this astonishing lily.

## **Distribution**

With respect to distribution, *Lilium polyphyllum* is confined to the northern sector of a few countries and needs attention, i.e. a distribution assessment at both country and regional levels. *Lilium polyphyllum* is narrowly present in China. It also occurs in Tibet, Nepal, Pakistan (the Hunza valley, which borders on four countries—Russia, Afghanistan, China and India) and the Wanga valley (in the north western Himalaya). In India, the species is confined in three states, i.e. Jammu and Kashmir, Himachal Pradesh and Uttarakhand (with few wild habitats and a limited number of lilies). I, and my colleagues, successfully identified three habitats of *Lilium polyphyllum* in the Garhwal Himalaya of Uttarakhand.

## **Medicinal Value**

*Lilium polyphyllum* grows its beautiful and delicate flowers in the month of June and these are loved by local people for temple offerings and home decorations for a day (its unpleasant fragrance means it is not kept inside peoples' homes overnight). The bulb of the lily has medicinal properties, as described in Ayurvedic texts, and is also used in modern pharmaceutical industries for the following purposes:

- as an aphrodisiac (to stimulate sexual desire);
- as a galactagogue (a medicine that promote secretion of milk in pregnant women);
- as an expectorant (aiding the secretion of the mucous membrane of the air passages and the removal of fluid by spitting);
- as a diuretic (promoting the flow of urine);
- as an antipyretic (counteracting fever)
- as a revitalizing tonic.

In Ayurveda, *Lilium polyphyllum* with another seven species, i.e. *Habenaria intermedia*, *Habenaria edgeworthii*, *Malaxis muscifera*, *Malaxis acuminata*, *Polygonatum verticillatum*, *Polygonatum cirrbifolium*, *Fritillaria roylei* constitute a group widely known as 'ASTAVARGA' used for its anti-ageing and vitality properties. In ancient times, Astavarga was even rare for the mightiest of kings to possess due to the rarity of these plants.

## **Present Work**

While reading the Conservation Assessment Management Plan (CAMP) IUCN 2003 report, I found *Lilium polyphyllum* was reported to have lost 80% of its known populations in the last ten years and that it was threatened with extinction in the future. Considering my research interest (conservation of threatened species) and the problems and priorities recommended by CAMP for *Lilium polyphyllum*,

I resolved to work on this lily and to try to devise ways to help save this critically endangered species. I pasted a piece of paper in front of my study table, which identified my research objectives and the major threats that would impede *Lilium polyphyllum*'s conservation.

CAMP RECOMMENDATIONS	INITIATIVES
Protection of habitats	Planting of seedlings in natural habitats
Improve propagation methods	Developed seed germination, Vegetative propagation and tissue culture methods for the species
Domestication & cultivation	Domestication trails with different doses of farmyard manure

Table 1. Recommendations and Initiatives for *Lilium polyphyllum*

My first priority, in relation to my conservation plan, was to explore possible natural habitats, for *Lilium polyphyllum*, in the Garhwal Himalaya. After I had trekked extensively in this remote and stunningly beautiful area, I discovered three locations, from an altitude of 2200 to 3200 metres above sea level, where plants of *Lilium polyphyllum* grew.

During my exploration I found *Lilium polyphyllum* under *Cedrus deodara* forests, which indicated that they were a shade loving lily, as they received sunlight for only two to four hours a day. They were growing on northern slopes where it is cooler and the soil dries out less rapidly. Shade helps *Lilium polyphyllum*, as it does other lilies, to retain flower colour and to prolong the flowering season. Gentle slopes (30-35 degree) and porous soil provide sufficient drainage. Bulbs of *Lilium polyphyllum* love acidic soil (pH ranges from 6.5 to 6.8). This lily grows in a good composition of sand, silt and humus (5-7 inches thick), and the bulb absorbs almost 2-3 times its original weight of water, which helps in the dry season of the year. This permits extensive root development for nutrient absorption during harsh conditions in nature with fine water holding capacity. It also improves the physical condition of the soil and makes it easier to work. I found many earthworms while collecting soil for analysis, better known as farmer's friends in India for maintaining soil fertility.

After senescence, in its natural habitats, I collected seeds of *Lilium polyphyllum* and germinated these under laboratory conditions with different hormonal and nitrogenous compounds. 82% germination was achieved when seeds were





A stem of *Lilium polyphyllum* with some flowers and seed capsules in the early stages of development.

treated with sodium hypochlorite (a surface disinfectant) for 30 minutes. Sodium hypochlorite is responsible for the scarification of the seed coat, which both permits and improves water and oxygen diffusion. The germination is of the hypogeal type and may take 40 days to complete at 25°C with 16 hours light and 8 hours dark conditions. Vegetative propagation is a quicker method for achieving flowering sized plants than growing from seed. Bulb division occurs with *Lilium polyphyllum* in its natural habitat and this seems to lead to a high survival rate among the younger plants. A mature bulb may have 25-30 scales. Using hormonal treatment (Indole Butyric acid- a rooting agent) a bulb may yield 75-90 new plantlets. This technique can be adopted for the cultivation of this lily for getting the exact individuals from parent plants.

While studying the phenology of *Lilium polyphyllum* in its natural habitats, with its microclimatic conditions (temperature, light intensity, soil temperature, humidity etc), what I observed was that *Lilium polyphyllum*'s shoot emerges in its natural habitat after snowmelts in March and while attaining full vegetative growth it starts to form buds in the month of April. During May it develops full buds that bend downwards and are ready to flower in the month of June (at 2200

metres). It flowers for a short period of ten to 15 days and completes pollination to produce a capsule. Shrubs, in the wild, are useful companions to support lily stems. During July to September pod development occurs, i.e. the formation and maturation phase is completed and in mid-October to mid-November capsules burst to disperse seeds for continuing its future existence in nature.

Later the natural habitat is covered with snow, from December to February, and the temperature drops below zero degrees centigrade. At this time of the year, the contractile roots of *Lilium polyphyllum* serve two purposes, nutrient and water absorption and pulling the bulb deeper into the soil during harsh climatic conditions to protect it from frost injury.

For domestic purposes seedlings were raised at our experimental nursery, with different mixtures of litter and buffalo dung, to productivity in terms of economic yield, i.e. number of bulbs, and biochemical contents. Experiments are in progress that will be helpful for the purposes of further field cultivation.

During 2006 we successfully developed three propagation methods, i.e. seed germination, vegetative propagation and tissue culture. Seed germination and vegetative propagation methods will fulfill the needs of farmers with easy availability and less handling technicalities. Tissue culture will be supportive for reducing the pressure on *Lilium polyphyllum*'s natural population and also fulfill the needs of pharmaceutical companies through mass multiplication of bulbs. I believe the floriculture potential of *Lilium polyphyllum* can also be worked on and exploited.

### **Future Needs**

*Lilium polyphyllum* is facing severe threats, in its natural habitats, and needs immediate protection through conservation. One of the basic steps for the conservation of *Lilium polyphyllum* is to explore its every possible natural pockets in other states of India (Jammu and Kashmir and the Himanchal Pradesh) and in different countries where it has been reported. This would help to provide appropriate data on its global status according to IUCN and also to establish a global gene bank for further experiments and future generations. Morphological and genetic variability between and among different populations of *Lilium polyphyllum* should supply researchers with elite populations for further breeding and conservation programmes.

I hope this article will encourage people to take an interest in and to help conserve this beautiful but critically endangered lily.



*L. pyrenaicum*



## European lilies untangled

*The classification of lilies is a difficult and potentially controversial subject area, which **Iain Brodie** addresses, in relation to European species, in the following article.*

### **Key words**

Lilium, taxonomy, cladastic, phylogenetic, nrDNA, Europe, Mediterranean, Balkans.

### **Abstract**

This paper is in the form of a taxonomical revision of the species of *Lilium*, which are endemic to the European region north of the Mediterranean and Adriatic Seas where they are largely to be found in the various mountain chains of this region, as well as to the east in the Caucasus and Anatolian mountains. Currently their reference is restricted in the literature to their status as subspecies and varieties of *Lilium pyrenaicum* Gouan which several researchers in the first decade of the 21st century have demonstrated cannot now be the case. For the sake of completeness, reference is made in passing to those taxa native to the adjacent European Caucasus mountains, as well as the Anatolian Black Sea and Iranian Caspian Sea regions, but these are not dealt with in detail here.

While researching the taxonomy of Lilies for the new Monograph on the genus *Lilium*, I have repeatedly come across conflicting views and opinions in respect of the correct taxonomical position for numerous *Lilium* taxa throughout the world at both section and species levels. This included those growing in the European continental region along with the adjacent Turkish and Caucasus regions, which latter is technically within Europe albeit where certain of the taxa are right on the very margins. As will be explained, part of this dilemma, and the changes that result, stem from the discoveries that new technologies have now made possible in laboratories. The remainder of the changes stem from an extremely detailed investigation undertaken into the names used along with their relevant publication dates. The result is that several familiar, often long term familiar, names now require to be dropped as they must now be regarded as synonyms.

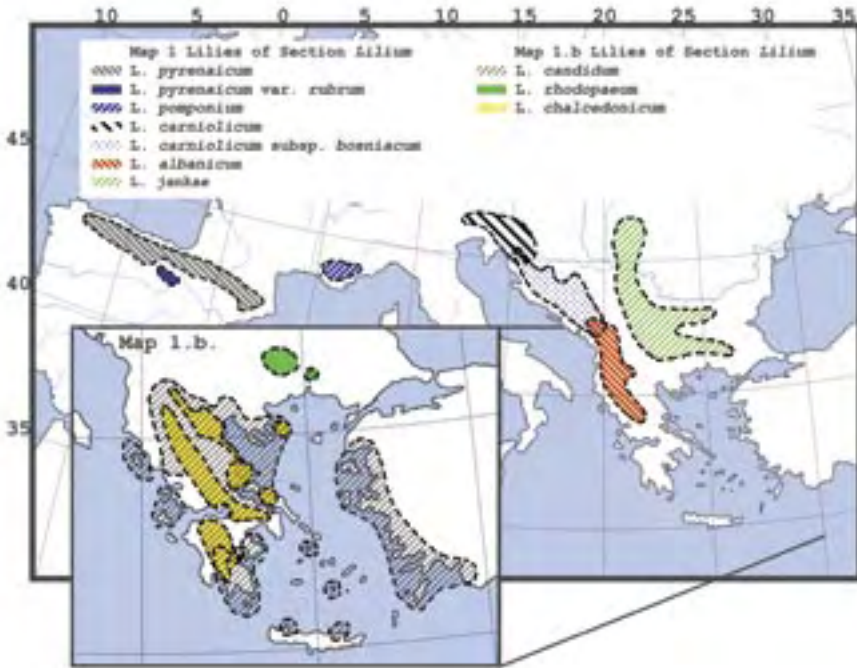
Before proceeding further it is essential to help readers appreciate the background relating to the universally accepted International Rules of Botanical Nomenclature in respect of the naming of botanical species, whether in the genus *Lilium* as considered here, or any other genus. The first of these is the



*Lilium martagon*.

MAP 1

Lilies of Section *Lilium*



requirement for a validly published botanical description in botanical Latin. The second is the date of publication.

Anyone venturing down the path of botanical taxonomy is inevitably brought up sharp between the opposing factions of the so-called “lumpers and splitters”. However, with the advent of new research tools much of both the guess work and speculation have been removed. Therefore, in the light of these recent developments this paper is intended to make RHS Lily Group members and others similarly interested in the genus *Lilium* aware of the current taxonomical status of the European lilies, but not necessarily the detailed distribution of all of the lilies in question. However, an excellent article by Arne Strid, *The Lilies of Greece* with distribution maps for lilies in Greece can be found in *Lilies & Related Plants* (2007-2008) pp. 18-26 which can be usefully read in conjunction with the maps provided here.

As previously explained it is only intended here to deal in detail with those European taxa naturally distributed around the Mediterranean, Aegean, the

European Alps as well as the Balkan regions of southern Europe, roughly below 50 degrees North, (see Table 2). Although *Lilium martagon*, *sensu lato*, has a much more northerly distribution, where, as *L. martagon* var. *daugava* Lacis this variety reaches approximately 57 degrees North in Latvia on the eastern side of the Baltic Sea, (see Map #1). Those taxa distributed around the Black Sea regions and Caucasus Mountains will be treated separately at another time.

As things currently stand in relation to the taxonomy of European lilies, various current publications and traditional records, e.g. *Flora Europea*, *Index Kewensis* and the RHS *International Register and Checklist of Lilies* (2007), etc, list the following taxonomic status of *Lilium pyrenaicum* Gouan, along with its supposedly closely related taxa ranked variously at different times as either subspecies, varieties and forma, including amongst them *LL. albanicum*, *bosniacum*, *carniolicum*, *chalcedonicum*, *heldreichii*, *jankae*, *ledebourii*, *monadelphum*, *pomponium* and *ponticum*.

Referred to in this paper, and listed alphabetically, are the following taxa under their newly established taxonomic status, viz: *L. albanicum*, *L. aurantiacum*, *L. bulbiferum*, *L. bulbiferum* var. *chaixii*, *L. bulbiferum* var. *giganteum*, *L. candidum*, *L. carniolicum*, *L. carniolicum* subsp. *bosniacum*, *L. chalcedonicum*, *L. chalcedonicum* forma *heldreichii*, *L. ciliatum*, *L. jankae*, *L. martagon*, *L. martagon* var. *album*, *L. martagon* var. *albiflorum*, *L. martagon* var. *cattaniae*, *L. martagon* var. *cattaniae* 'Album Superbum', *L. martagon* var. *daugava*, *L. martagon* var. *hirsutum*, *L. martagon* var. *pilosiusculum*, *L. martagon* var. *sanguineo-purpureum*; and the most recently discovered taxa, *L. rhodopaeum*.

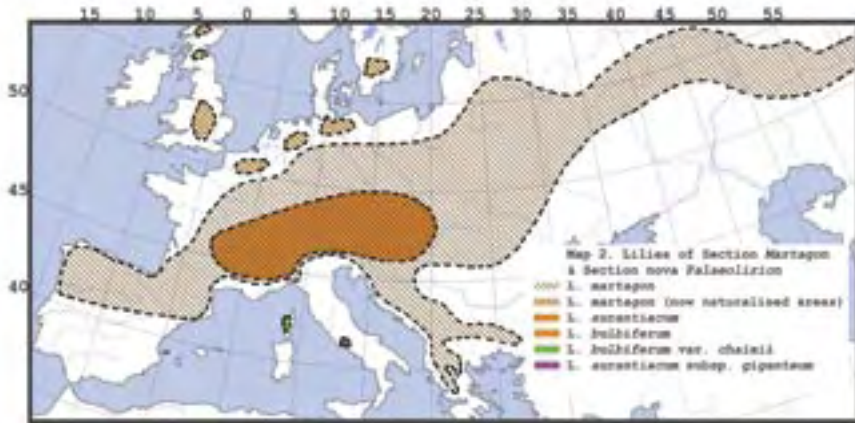
Not included in detail because their distribution lies outside the geographic area of this paper, the following taxa are however noted for the sake of completeness: viz: *L. akkusianum*, *L. kesselringianum*, *L. ledebourii*, *L. martagon* var. *caucasicum*, *L. martagon* var. *pilosiusculum*, *L. monadelphum*, *L. georgicum*, *L. szovitsianum* and *L. szovitsianum* var. *armenum*. While *Lilium ciliatum* is from Turkey and outwith the region under discussion it is included because it is dealt with by Rešetnik et al. It should be noted that *Lilium candidum* is also found naturally in both Turkey, Lebanon and Israel.

In the absence of detailed cladastic studies amongst the wider *Lilium martagon* 'family' and section, those lilies differing from the nominate form are referred to above at varieties level. Many of these lily's newly determined or amended status within sections *Lilium* and *Palaelirion* are as a result of the laboratory work referred to the work by Rešetnik, Liber, et al, (2007) publ. in *Plant Systematics & Evolution*. 265: 45-58 q.v., where their methodologies are discussed in detail and are not repeated here.

Early writers, pre Linnaeus, have recorded and reported the existence of lilies of various types but I intend to leave those early references aside in this

MAP 2

Lilies of Section *Martagon*



paper and restrict observations to the taxonomy in use in relatively more recent times otherwise this account would take up too much space in the current issue of *Lilies and Related Plants*. Nevertheless it might be of interest to know the comments by Gerard regarding the so called *Lilium bulbiferum* group alongside that of the *Lilium carniolicum* group dealt with by Rešetnik et al. Writing in 1597, Gerard comments “there have been from the beginning great controversies about the name of this red Lillie, the which controversies have been so ridiculous, and yet never censured, that it were much labour lost to repeate them ...for some have sought to mende others errors, and made more than were before”. It seems that Gerard, over four hundred years previously, clearly had a good feel for the problems of naming lilies, then as now. As I eventually found, having waded through an extensive range of earlier published literature resulting in the discovery so far of over 700 synonyms relating to perhaps hardly more than what may eventually prove to be around 140 taxa, at various taxonomic levels, collected together through gritted teeth in preparation for my forthcoming Monograph, there can be little doubt I will be adding further to that main Synonym Index before completion. Much of the conjecture and debate in respect of the correct taxonomy amongst European lilies now seems close to resolution owing to recent research.

The Phylogenetic relationships in respect of the *Lilium carniolicum* group show all the species fall within what is currently understood as Section *Liriotypus* as revised by Baranova into Section *Lilium* Linn. However, the degrees of

TABLE 1

## SECTIONAL SPECIES LIST

**Section *Dauroilirion* Wilson amend. Brodie:**

**Lectotype:** *L. pennsylvanicum*, *L. maculatum*, *L. sachalinense*, *L. bukosanense*, *L. x elegans*. All Eastern Asiatic species, for European taxa; see Section *Palaelirion* sec. nova.

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**Section *Lilium* Linn (1753), amend, pro part. *Liriotypus* Aschers. & Graebn., amend, Comber, incorp., *Eurolirium* Baranova., amend Brodie:**

**Lectotype:** *L. candidum*, *L. albanicum*, *L. carniolicum*, *L. carniolicum* subsp. *bosniacum*, *L. chalconicum*, *L. chalconicum* forma *heldreichii*, *L. ciliatum*, *L. jankae*, *L. kesselringianum*, *L. ledebourii*, *L. monadelphum*, *L. pomponium*, *L. ponticum*, *L. ponticum* var. *arvinense*, *L. pyrenaicum*, *L. rhodopaeum*, *L. szovitsianum*, and probably also *L. akkusianum*.

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**Section *Martagon* Duby (1828), amend. Comber:**

**Lectotype:** *L. martagon*, *L. martagon* var. *album*, *L. martagon* var. *albiflorum*, *L. martagon* var. *alpinum*, *L. martagon* var. *cattaniae*, *L. martagon* var. *cattaniae* 'Album Superbum', *L. martagon* var. *daugava*, *L. martagon* var. *sanguineo-purpureum*.

**Non European species excluded****Section *Palaelirion* sec. nova Brodie:**

**Lectotype:** *L. bulbiferum*, *L. bulbiferum* var. *chaixii*, *L. aurantiacum*, *L. aurantiacum* var. *giganteum*.

**Note:** According to the International Rules of Nomenclature Asch. & Graebn.'s Section *Liriotypus* (1905) is an invalid name having been preceded by Linnaeus's first use (1753) of the word *Lilium* and likewise Baranova's *Eurolirium* (1988), q.v. This being my only change from the published text in the research paper by Rešetnik et al.

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relationship vary and research groups these lilies according to their degrees of cladastic relationships. *Lilium martagon* and *Lilium bulbiferum*, etc, see Table One are recognised as representing 'out groups' respectively of Section *Lilium* (*Liriotypus*) Linn., and the doubtful, in Europe, Section *Dauroilirion* Comber. Map #1 shows the distribution of Section *Lilium*, while Map #2 refers to distribution of Section *Dauroilirion*, amended to section nova *Palaelirion*, and also to Section *Martagon*.

It is clear from Rešetnik et al's. research that this distinct group of lily species within Section *Lilium*, previously treated mostly by Mathews et al., as closely



related to *Lilium pyrenaicum* either at subspecific or varietas relationships demonstrates that this is no longer sustainable. While *LL. pomponium* and *pyrenaicum* forms a weakly supported sub-clade at a basal position (60%) in the group, distributed to the west of the continent, and the others are all found in a relatively homogenous geographic area around the Balkan littoral and adjacent mountain regions, *L. albanicum* is a discrete (91%) from *LL. carniolicum*, *carniolicum* subsp. *bosniacum* and *chalcedonicum* (98%) together with *jankae* very close but separate (100%). *LL. candidum* and *ciliatum* have been shown to form a close clade (60%). At the far end (100%) lies *LL. monadelphum* and *szovitsianum*, with *L. martagon* treated as an out-group. Rešetnik et al. mention that similar work on the Turkish members of Section *Lilium* (syn. *Liriotypus*) by İkinci et al., (2005) bear out the differentiation of those lilies as valid taxa at species level.

Clearly, as we now see, species within the *Lilium carniolicum* group are not closely related to *L. pyrenaicum*. Therefore it must seem both strange, and improbable, to find that those other taxa much further east such as *Lilium ponticum* etc, from much further away in both geographic and geological terms in Turkey and the Caucasus, could ever be sustainable in the relationship currently claimed for them with *L. pyrenaicum*. Even before Rešetnik et al., had undertaken their research we knew from the late Dr. Chris North's lily hybridisation project (1966-78), carried out at the Scottish Crop Research Institute near Dundee, that he had attempted to hybridise *L. pyrenaicum* with several others such as *L. carniolicum* as well as with *L. ciliatum* and *L. pomponium*, and that this was only possible through the means of embryo rescue under laboratory conditions. Those earlier attempts alone would or should have been sufficient to flag up the fact that these lilies were genetically distinct with barriers to crossing amongst themselves and would therefore be valid taxa like *L. pomponium* whose geographical distribution is closer to *L. pyrenaicum* than to *L. carniolicum*, (see Map 1).

Having reviewed the position in respect of the European lilies within Section *Lilium* (syn. *Liriotypus*) it may be of interest to consider what is proposed for the taxonomy of European lilies within the Section *Daurolirion* Comber, amend Brodie. Assuming for the present that this Section is sustainable based as it is on the Asiatic *Lilium pensylvanicum* Ker-Gawler (1805), syn. *L. dauricum* Ker-Gawler (1809), the Lectotype for that Section, something I have reservations about, which, if borne out in future, would require the European taxa to be placed elsewhere in a Section nova, *Palaelirion* as here proposed (Appendix 3.). Currently other members in Section *Daurolirion* are found in Europe except *L. maculatum*, *L. sachalinense*, *L. bukosanense*, et al., as well as the formerly disputed identity of the ancient Japanese hybrid *L. x elegans*. The European lilies taxa are, *L. aurantiacum* (syn. *L. bulbiferum* var. *croceum*), *L. bulbiferum* and

TABLE 2

**SYNONYM LIST** including most but not all records

- L. angustifolium* Miller = *L. pomponium* Linn.
- L. bulbiferum* var. *aurantiacum* Regel = *L. aurantiacum* Weston
- L. bulbiferum* var. *croceum* (Chaix) Persoon = *L. aurantiacum* Weston
- L. bulbiferum* var. *giganteum* N. Terracino = *L. aurantiacum* var. *giganteum* (N. Terrac.) Stearn
- L. chalconicum* var. *albanicum* (Griseb.) Asch. & Grachn. = *L. albanicum* Grisebach
- L. chalconicum* subsp. *heldreichii* Freyn = *L. chalconicum* forma. *heldreichii* (Freyn) Brodie
- L. chalconicum* var. *punctatum* Reuther = *L. chalconicum* var. *maculatum* hort. Constable
- L. chalconicum* var. *thessalum* Formanek = *L. chalconicum* forma. *heldreichii* (Freyn) Brodie
- L. chalconicum* Linn. 1762 non 1753 = *L. carniolicum* Bernt. & Koch. 1837
- L. flavum* Lamarck & De Candolle = *L. pyrenaicum* Gouan
- L. heldreichii* Freyn = *L. chalconicum* forma. *heldreichii* (Freyn) Brodie
- L. humile* Miller = *L. aurantiacum* Weston
- L. martagon* var. *dalmaticum* Elwes = *L. martagon* var. *sanguineo-purpureum* G. Beck
- L. pomponium* Willkomm & Lange non Linn. = *L. pyrenaicum* var. *rubrum* hort. Marshall
- L. pomponium* Redoubte non Linn. = *L. chalconicum* Linn.
- L. pomponium* var. *carniolicum* (Bernh. ex Koch) Fiori. = *L. carniolicum* Bernh. ex Koch
- L. pomponium* var. Beta Ker-Gawler = *L. pyrenaicum* Gouan
- L. pyrenaicum* Baumg. non Gouan = *L. jankae* Kerner
- L. pyrenaicum* Bubani = *L. pyrenaicum* Gouan
- L. pyrenaicum* Griseb., non Gouan = *L. carniolicum* subsp. *albanicum* (Griseb.) Hayek
- L. pyrenaicum* subsp. *albanicum* (Griseb.) Mathews = *L. albanicum* Grisebach
- L. pyrenaicum* var. *bosniacum* (Beck) Mathews = *L. carniolicum* subsp. *bosniacum* (Beck) Fritsch
- L. pyrenaicum* subsp. *carniolicum* (W.Koch) Mathews = *L. carniolicum* W. Koch
- L. pyrenaicum* subsp. *carniolicum* var. *albanicum* (Grisb.) Mathews = *L. albanicum* Grisb.
- L. pyrenaicum* subsp. *carniolicum* (W.Koch) Mathews var. *bosniacum* = *L. carniolicum* subsp. *bosniacum* (Beck) Fritsch
- L. pyrenaicum* subsp. *carniolicum* var. *carniolicum* (W.Koch) Mathews = *L. carniolicum* Bernh. ex Koch
- L. pyrenaicum* subsp. *carniolicum* var. *jankae* (A.Kern.) Mathews = *L. jankae* A.Kern.
- L. pyrenaicum* subsp. *chalconicum* (Linn.) Mathews = *L. chalconicum* Linn.
- L. pyrenaicum* subsp. *heldreichii* (Linn.) Freyn = *L. chalconicum* forma *heldreichii* (Freyn) Brodie
- L. pyrenaicum* subsp. *jankae* (A.Kerner) Mathews. = *L. jankae* A. Kerner
- L. pyrenaicum* subsp. *pomponum* Linn. = *L. pomponum* K. Koch
- L. pyrenaicum* forma *rubrum* Stoker non Linn. = *L. pyrenaicum* var. *rubrum* hort. Marshall
- L. rubrum* Lamarck & De Candolle = *L. pomponium* Linn.

*L. bulbiferum* var. *chaixii*, as well as the micro taxon, *L. bulbiferum* var. *giganteum*.

The big surprise has proved to be the closeness of the relationship within this group of *L. chalcedonicum* with *L. bosniacum* and *L. carniolicum* whose previously believed close relationships are noted in the List of Synonyms, (Table 2). Likewise, although we know that the hybrid *Lilium* x *testaceum* is a cross between *L. candidum* and *L. chalcedonicum*, the former's nearest close genetic relative has now proven to be *Lilium ciliatum*, not as had been imagined it was most likely to be with *Lilium chalcedonicum*. I have not yet found any record in the published literature of a hybrid being produced between these two, *L. candidum* and *L. ciliatum*; perhaps this is a project to challenge readers interested in such a prospect at some future date.

Whilst the final Section to be considered here is that of Section *Martagon* Duby, amend. Brodie, this may perhaps include as many taxa as that of Section *Lilium* at species level does in Europe. It certainly includes lilies of very diverse form and colour spread over a truly prodigious geographic area particularly when the distributions of *Lilium martagon* var. *pilosiusculum* and possibly also that of *Lilium tianshanicum* are taken into account.

There are three European *Lilium* taxa recorded in variously the IUCN Red Data Book and National Lists of European Threatened Plants List; viz: *Lilium carniolicum* var. *artvinense* in Italy, *Lilium pomponium* in both France and Italy listed as vulnerable, and *Lilium rhodopaeum* from both Greece and Bulgaria as rare. The taxonomical nomenclature used in *The Italian Vascular Flora* for the first named is inaccurate as the plant is named incorrectly. *Lilium artvinense*, sensu strictu, is a variety of *Lilium ponticum* from eastern Turkey. *Lilium carniolicum* var. *carniolicum* is the only form of that specie found growing in Italy.

## Appendix 1

Sections within *Lilium*, Tournefort, Inst. Rei. Herb. 369 (1700);  
Linnaeus, Sp. Pl. 1. (1753).

### ***Lilium***

Linnaeus (1753).

This section predates that of both Eulirion of Endlicher which included species such as *LL. candidum*, *cordifolium*—syn. *Cardiocrinum cordatum*, and *longiflorum*. Next we had *Liriotypus* of Asch. & Graeb. amend. Stearn (1935). In all of these *Lilium candidum* is cited as both lectotype and often sole representative according to those authorities. Therefore Section *Lilium* of Linnaeus (1753) is the earliest and in the light of Rešetnik, et al., demonstrating through their cladastic research that the species *LL. albanicum*, *carniolicum*, *chalcedonicum*, *ciliatum*, *jankae*, *pomponium* and *pyrenaicum*, having close

relative values, to varying degrees, with *L. candidum*, these taxa therefore require to be removed from both *Eulirion* and *Liriotypus* and placed along with *L. candidum*, in section *Lilium* Linn.

### ***Martagon***

Duby (1828) Bot. Gall. 1:462, *non* Reichenbach (1830)., amend. Brodie.

The authority for section *Martagon* is most often cited as of Reichenbach (1830)., however as pointed out by Baranova (1988) the earliest authority is that of Duby (1828). As originally proposed section *Martagon* included as Lectotype, *L. martagon* is followed by *L. chalconicum* and *L. pomponium* however we now know from Rešetnik et al. that the former must be regarded as an out group from the latter two taxa leaving *L. martagon*, in my view, pending further cladistic studies, as the sole representative of this section with the sectional status and allocation of several taxa such as those e.g. of *L. distichum*, *L. hansonii*, *L. mediolooides* and *L. tsingtauense* yet to be determined.

### ***Palaelirion***

Brodie (2009), *pro parte*, *Daurolirion* Comber (1949).

Following study of all the sections in the genus *Lilium* along with detailed study of the geographical distribution and the total morphological characters of each taxa allocated to *Daurolirion* Comber, it has become clear those European taxa are significantly distinct from the Asiatic taxa in a number of characters sufficient for them to no longer warrant inclusion in *Daurolirion* and they therefore now require to be allocated to a section nova, which I therefore propose as *Palaelirion*. Prior to Comber's section *Daurolirion*, Wilson adopted Endlicher's *Pseudolirium* (1836) which included *LL. bulbiferum*, *bulbiferum* var. *croceum*—syn. *aurantiacum*, *catesbei*, *concolor*, *pensylvanicum*—syn. *dauricum*, as well as *philadelphicum* and *tsingtauense*, the Lectotype being *L. philadelphicum*. However, subsequently Baker also proposed section *Isiolirion* (1871) with an almost identical composition of species.

## **Appendix 2**

Section *Pseudolirium* Endlicher (1836), amend Comber (1949).

As currently presented this section includes as its Lectotype *Lilium catesbei* along with *L. pensylvanicum* (syn. *L. dauricum*) which also appears in Comber's Section *Daurolirion*, along with *philadelphicum*, *tsingtauense* amongst others, as well as the European *L. aurantiacum* and *L. bulbiferum*. This aggregation of taxa cannot be sustainable based as it is, loosely it seems, on a supposed common morphology of 'goblet shaped' inflorescence amongst species growing variously across Central Europe, North America and Eastern Asia. Therefore, I propose

the removal of the European species to a new section, Section *Palaelirion* ...see Appendix 3. It follows logically that those North American species will require reassigning too with the Asiatic species remaining in Comber's Section *Daurolirion* as now, this proposal is addressed in the new Monograph.

### Appendix 3

Section *Palaelirion* (sectio nova) Brodie (2009)

Germinatio seminum hypogaeae praescens. Bulbus albus globus ovatus. Caulis cum et sine bulbilis, basi non stoloniformis et radices emittens. Folia dispersa linearis laceolatus. Flores erectus cupulatus tepala unguicularis, revoluta ver recurvata, marginibus sulci nectarei pubescentibus vel glabris. Stigma medio.

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*L. martagon*.

Map Credits

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Map 1. Mediterranean & Balkan Region. Section *Lilium (Liriotypus)*

Map 2. European Region. Sections *Martagon* and *Palaelirion*.

Tables

Table 1. Sectional Species List.

Table 2. Synonym List.

Note

This paper is adapted by the author from the section on taxonomy in the new Monograph on *Lilium* [in prep.]





A field of Oriental hybrid lilies.

## 60 years of growing lilies in New Zealand

*In this article **William F. Doreen** reflects on a career spanning 60 years of commercial lily growing and acknowledges how fortunate he was to have chosen a profession that he also considers to have been a much loved vocation.*

It is wonderful to look back over 60 years of growing lilies commercially and see the strides taken in the evolution of the many new hybrids that have resulted from hybridising among lily species and the volumes of lilies sold at auction, not only in New Zealand, but also in the many counties I have visited. Looking back over my career of 60 years, I am aware that lilies have been grown and sold every day of the year, which is a tangible measure of the popularity of the genus *Lilium*. Most lilies grown and sold in the 1950s and sent to the auctions, were the upward facing mid-century hybrids which could be placed in a cellophane sleeve so as not to break off the buds. Mr Jan de Graaff at this stage was producing many new Asiatic hybrids, of which 'Enchantment' was the most famous.

What wonders I, and my wife, have seen and participated in. Growing lilies has never just been a job, as most people think of their employment. To my wife



Oriental hybrids in shades of pink.

and I, in our nursery, it has been a wonderful job to be creative, to have a job that is also a hobby you enjoy every day, to look forward and imagine what new creations are going to flower this year.

Let me start at the beginning of my career, 1949, when I went to Massey Agricultural College (now Massey University) to gain the Diploma of Horticulture, through studying the sciences of growing plants. When I wasn't being a keen student, I was able to find work, around the campus, in my spare time. This work involved keeping the gardens looking at their best and also enabled me to work in the garden of my Horticultural tutor, Dr John Yeates, who was Head of the Botany Department. Most lily people know that Dr Yeates' hobby was hybridising with *L. auratum*. One evening, all the Horticultural students were invited to his home to see the magnificent array of these majestic lilies. I suppose I was awe-struck by the overpowering scent in the evening air, the purity of the colours, the perfect foliage and the explanations of how he, (Dr Yeates), obtained such beauty. From then on growing lilies was to be my vocation for life.

With my wife, Carol, I set about establishing a nursery that was to be called 'Lilies International Ltd'. This company would supply flowers to all auction houses in New Zealand—every week of the year—and to many of the Asian markets. It also supplied bulbs and tubers to the USA and some, ironically, to Holland.

In 1966, Mr Jan de Graaff invited me to the Oregon Bulb Farms (OBF) to see how they mass produced large numbers of lilies and marketed them all over the USA and the world. This was a great advantage, and on my return, I modelled my nursery on what I saw and learned.

For years before this, I had propagated lilies by standing the scales up like rows of cuttings in seed trays. Unfortunately, this was not the way to proceed. Lily scales do not need light to form bulblets on the base. With these preliminary comments, I will explain the methods of production, for scaling, in the nursery.



An impressive floral display.

Scaling bulbs is a straightforward operation. The scales overlap each other in a circular manner. They are broken off as close to the base as possible. The scales are then laid out on benches, so the broken ends dry over a 24 hour period. At this point, the scales are dusted over with a fungicide, which is best done in a plastic bag. They are then shaken vigorously and placed in lined boxes of polythene and covered over with a mixture of perlite and sawdust, one layer after another. This can also be done in polythene bags with small lots of scales.

The idea of drying the base is because a substance exudes from the base called 'suberein' which forms the callus and should be dry before dusting. This prevents a lot of rotting, which can occur when the scales are damp.

I have often read that gardeners dig out the bulbs in the autumn and scale immediately, before washing. The chances of rotting are greatly enhanced if you do not take simple precautions beforehand. It is best not to add any water to the mix of peat, sphagnum, and perlite, otherwise the mix will become too wet over a period of time. You should then place boxes or bags at a regular temperature of 70 degrees F, or 22 degrees C. They can be put on shelves in your hot water cylinder cupboard, but as a commercial grower, we had special incubating rooms which kept the temperature constant. They were kept at this heat for six weeks, dropping the temperature down to 50 degrees F. and leaving them at this temperature for three months. After this procedure, the bulbs were transferred





Scaling bulbs for the vegetative propagation of lilies.

to the coolstore for a further ten weeks, and then planted out in spring in raised beds where the most important factor is good drainage.

The reason for putting scales in the heat and then the cool store, is for vernalisation, i.e. to simulate a winter period to break dormancy, which takes eight weeks with lilies. All this is applied to the *auratum* (oriental series) only. Asiatics and trumpets, after the heat treatment, just burst away into immediate growth, so should be planted promptly.

When I started growing lilies in quantity, I concentrated my efforts on the *auratum* lily. These majestic lilies had great appeal to the public, and still do, although they appeared to be more difficult to grow than other lilies. However, once the growing had been mastered they proved to be a great success and they were sold far and wide.

The other method of propagation, i.e. pollinating and growing different hybrids, is quite fascinating, as you never know what to expect when the hybrid comes into flower. In some species, such as *L. regale*, *L. formosanum* and *L. tenuifolium* (a.k.a. *L. pumilum*) the variation may not be very great, but with *L. auratum* crossed with *L. speciosum*, you will get a great variation, a good flower formation and colour, so this led me to clone the very best, i.e. strong in stem, disease resistant and with good flower formation.

After learning all the techniques of crossing *auratum* lilies, I then set myself

the challenge of making the oriental lily flower face straight up, a formidable task. However, I knew also that four other hybridisers in the world were attempting this. It is natural for all *auratum* flowers to face downwards and all the hybrids from them are also downward facing, so the challenge was to reverse this, i.e. to do something that no one had done before. As it turned out Leslie Woodriff, in the USA, created that wonderful hybrid 'Stargazer'. I, in fact, hybridised upward facing hybrids at the same time, one of which was 'Snowdrift' and there were many more.

What a delight it has been to be one of a small band of hybridisers all working on a similar challenge in various parts of the world. I have to say here, that this has been a project over a 30 year span, the recording of which, being a huge job, was gallantly undertaken by my wife.

Perhaps I should explain my hybridising method, so that others can get the same enjoyment, as I do, when their new hybrid lilies flower.

Soon after the flower opens, the stigma of the lily becomes covered by a sticky solution that helps the pollen to adhere to the stigma. If the weather is not too wet pollen placed on the stigma a day or two before it becomes sticky will remain in a viable condition to germinate when the stigma becomes sticky. The anthers should preferably be removed, even if the lily being pollinated is self-sterile, as it makes for a cleaner stigma.

In New Zealand natural seed setting does not take place except when night-flying moths fly from one variety to another, which is quite close by or a matter of inches or a foot away. In this way, cross pollination could happen. In a bed of one clone, the moths working in the same way would simply transfer pollen of the same clone, or no fertilisation would occur. This explanation seems to fit best with the facts.

The actual growing of lilies is not a problem if you have good drainage, which is most essential, and you have the correct acidity 6 - 6.5 ph

The first essential is drainage. Lilies do not like wet feet, whether it is in a container or in the ground. The soil must be free draining or beds must be raised up 10 or 12cm. Although our soil is free draining, for ease of cultivation and planting, most of our plantings use the bed system.

Here in my home town of Levin, New Zealand, the climate is like certain areas of the Mediterranean. We get reflection from the clouds, which bank up against the mountains behind us. We also have an extra amount of ultra violet light which does fade out some of the yellow in our trumpet lilies.

I should say here, that I import containers of Dutch bulbs which will flower in our winter months under glass. Dutch bulbs give production in New Zealand from April-October, our winter months. New Zealand grown bulbs give production from October to March, which are our summer months.

I have been particularly fortunate in being a producer of a distinctive crop which is grown in many parts of the world and have become reasonably well known for contributions to many Lily Societies and other producers. This has enabled me, accompanied by my wife, to be invited to many countries such as Japan and Israel, besides many more. In Japan, my wife and I saw *L. auratum* lilies which were growing on cliffs, amongst other indigenous plants. We also saw them being cultivated in nurseries. Many Asiatic forms had seeded in crevices in the concrete and numerous places where people walked, particularly in the southern parts of the country. My wife and I were treated like ambassadors and met many students, from horticultural facilities, in our conducted tours who wanted to learn about the growing of lilies.

Another great invitation I received was to visit Israel where I gave a lecture on *Sandersonia aurantiaca* to a very large audience. I have grown this plant, which is indigenous to Natal in South Africa and now prohibited by law to be exported, for about 30 years. For those not familiar with this plant, it belongs to the *Liliaceae* family, one specie, tuberose rooted, has a leafy erect stem and flowers like little bells, orange in colour, and sometimes called the 'Chinese Lantern Lily'. They grow from seed and given the right treatment, they are a wonderful plant, which flowers in New Zealand for Christmas in December. We have sold many millions of these flowers through Asia and USA.

Now in retirement, I look back over these wonderful years, starting with nothing and building up a major business and thinking that if I could do it (of course with family support), others can do the same. However, you have to be prepared to work long hours, particularly in the formative years, and have good family support.



*L. regale* at Les Peyronnies Hautes



## Experiences with lilies over my second forty years.

*In this article **Tom Isaac** writes about his long association with lilies, in gardens he has developed in both Britain and France.*

I am a retired dairy farmer. I have always loved flowers and made and tended gardens on the farms I rented through a wonderful life of slavery to my cows. Farming without capital is not easy but a keeping a dairy herd was probably the only way for an outsider to survive at that time, but impossible now.

In my forties, having educated our three children, I sold the Friesians and changed to beef cattle, I soon specialized in pedigree Charolais. These huge white French cattle were good to me.

My wife and I had bought a house called The Meade, near Bury St. Edmunds in Suffolk, and gradually gave up the tenancies of the main farms ten miles away.

At last we had a pretty house of our own with the framework of an old garden within which to work. We also had a little more time and in a small walled garden we had some *candidum* lilies. These were not exhibition lilies, but they were faithful and gave us pleasure for fourteen years and may still be there. In SW France where we now live, I had three friends with masses of perfect *candidum* lilies growing against the walls of a chateau and old outbuildings, but which they



My Queen and  
'African Queen'.

hardly noticed, although they were a dream. Four years after admiring these lilies they were gone without a trace and we do not know why.

I have a small seedy patch of *candidum* which provide me with an early, perhaps in February, killing ground for lily beetles. I do not spray them, but I squash the brutes before and after lunch. I find the beetles leave the *candidum* as soon as other lilies are about a foot tall and do not return to them. The early beetles must hibernate elsewhere. I have never seen beetles on *L. henryi*, in England or France, nor do they favour the strongest varieties, e.g. 'Leslie Woodriff', 'Scherazade', 'Silk Road', 'African Queen' etc. However, they favour instead weaker or damaged lilies. This is despite my passionate regime to eradicate them. I have seen the damage lily beetles can do in this neighbourhood and it is considerable.

I have been disturbed to find these beetles on *Alstroemeria* plants on 18th October. I killed 25 on one plant and 18 on another nearby. This slaughter total is over three times more than I have ever had in the summer when the beetles are easy to kill in pairs. However, I could find no evidence of them feeding or hatching on these plants, nor on lilies in the area. I find few beetles at and after flowering.

When I lived in Suffolk I fell totally in love with Dr. North's Greek gods lilies, because of their grace and elegant form. I started to grow 'Enchantment' and 'Destiny' about the same time. The colour and beauty of these lilies and others have led me to love and dream of lilies ever since.

I grew 'Orestes'—the first to flower each year—and 'Eros'. 'Theseus', and



'Karen North'



'Orestes'

some other North hybrids grew well in borders and in pots. Passing though the Fens one day, I saw that workmen were making a new crossroads and had accumulated a pile of lovely black earth. I stopped and asked the foreman if I could buy a couple of lorry loads. For a small sum, two enormous lorries, each carrying 22 cubic metres of soil, arrived. As well as growing every weed, this soil was a revelation, as self-sown lily seed grew into bulbs the size of walnuts in their first year. *Meconopsis* also thrived.

I was proud of my borders and invited an old friend to come and see them. She was a true plantswoman and also an artist. She came, stopped, looked and said of my lilies, "Oh, Tom they are magnificent!" She thought for a moment and said "but aren't they a little vulgar!" And so they were!

I was having heart trouble and was advised to retire so my wife and I sold our prize-winning herd in a magnificent sale and, to reduce regrets, moved to a new adventure in France in 1987. Recently the purchaser of the Meade, (our former house), who had been President of the British Plant Society and the RHS Alpine Society, telephoned me about a local problem. He finished his call by saying "I do love your garden!" What a generous remark, I thought, after I had owned and tended this garden for over 20 years!

We moved in June, 1987, and had to leave all our lilies, so many named after friends who had given them to us, and that fen soil.

In France we bought a small chateau, which required a lot of work. In between carrying out extensive repairs and decoration, I grew a variety of lilies and learned how easy it can be to multiply them from seeds, bulbils and scales. I grew ten tubs with (I think) 15 'Karen' North plants in them. I also grew several other lily varieties in the park and gardens.

After 14 years we moved to Les Peyronnies Hautes in the Dordogne. This is a 500 year old house with two hectares of garden, which had to be started from scratch. It was more than from scratch, actually, as I had to dig out the chalk rock mechanically to make flowerbeds. Again I grew many lilies, including *L. regale*.

I am frequently disappointed that so many lilies from all sources, including seed, tend to flower for only two years. I feel guilty about this, but simply do not know how to solve the problem, as, with identical treatment, some varieties establish themselves and grow like trees. But then again, some bulbs disappear, some have their roots and hearts eaten by silvery tiny worms and others just rot.

Lily bulbs are no longer expensive to buy, but British nurseries will not sell them, or plants, to France. This is because parcel post from England, even by carrier, so often fails to arrive, as I know from experience. All internet references to Dutch bulbs bring you back to the big French Garden Centres, (which are very expensive), or British firms who will not supply to non-UK customers!

There is something magical about lilies. The excitement of the growing tips, some like rockets, coming up in spring. Despite the fear of frost, and the lily beetle, the sheer challenge to produce beautiful flowers is normally well rewarded. I like a challenge but 2008 was a disaster. The lilies came up early in February, which was warm and sunny. Almost all of my 300 lilies were cut down by two frosts of minus 6 Centigrade and all the cherries, plums and figs lost. Some of the lily bulbs look sound but have made no roots, so we hope for better results in future.

Friends ask, "Why do you worry about lilies, the borders are fine as they are?" and I answer, "It is something about their style and their form that attracts me, maybe it's just Love."



# Thoughts on the classification of species lilies – past and present

*In this article **Alan Mitchell** makes some personal observations on the situation – past and present – with regard to the classification of species lilies.*

It is a natural human desire to impose order on chaos and as lily growers are humans naturally they seek to impose order on lilies. At the garden level this desire for order might involve growing lilies of different species groups in discrete arrangements, while at a less prosaic level this desire has led and continues to lead specialists to attempt to arrive at an accurate classification of species lilies. For the best part of two centuries (or longer) the classification of lilies has been based on morphology. It is likely, however, that DNA analysis will replace morphology in pursuit of imposing definitive order on the beautiful chaos of my favourite genus. What follows is an attempt, by an interested if somewhat bemused amateur lily grower, to get to grips with the approaches and methods that have been used and are currently being used to classify species lilies. However, being acutely aware of my limitations and given the scale of the task, I will confine my comments to the *candidum* group. Apart from the impediment of my limitations, I have made this decision for two reasons: 1. the *candidum* group seems to have attracted more attention from classifiers and researchers than the other groups and 2. it is my favourite group.

Given the complexity of the shifting sand of lily classification I feel I need an anchor to inhibit me moving from shifting sand to quicksand and that anchor resides in the meaning of the word epistemology, which (according to my dictionary) “is the study of the source, nature and limitations of knowledge”. It is the selective application of the meaning of epistemology, to the various aspects of lily classification dealt with henceforth, that, I hope, will guide me safely, i.e. by avoiding the quicksand, to the conclusion of this article.

It might be useful, before launching forth about the limitations, or otherwise, of any of the knowledge to which I will shortly refer, to list the species that occupy the *candidum* group and to consider some of their characteristics, especially, but not exclusively, those of what Comber (1949) termed the Lectotype (type) species, i.e. *L. candidum* and also *L. bulbiferum*. The most current information I have been able to obtain, on the species contained in the *candidum* group, is from a superb Internet website known as MAIN The Genus *Lilium*, <http://www.the-genus-lilium.com/main.htm> It is worth quoting the reason for the website's existence, “The purpose of this site is to become an important Europe-based



forum for the scientist as well as for the gardener for up-to-date information on *Lilium* species.” The website lists, describes and provides photographs of 19 species and, where applicable, their varieties as members of the *candidum* group. An indication that the site is true to its purpose, as quoted earlier in this paragraph, is contained in its upgrading of *L. bosniacum*, *L. albanicum*



**Above left**, *L. polyphyllum*, the isolated member of the *candidum* group.  
**Top right**, *L. albanicum*, promoted from *L. carniolicum* var. *albanicum*.  
**Middle**, *L. bulbiferum*, a species with a tenuous hold on the *candidum* group.  
**Bottom**, *L. candidum*, the Lectotype of the group, but for how much longer?



**Above**, Some of the members of the *candidum* group, showing their beauty and diversity with **Top left**, *Lilium ledebourii*. **Top right**, *L. chalcedonicum*. **Middle left**, *L. ciliatum*. **Middle right**, *L. monadelphum* and **Bottom**, *L. pomponium*.

and *L. jankae* from varieties of *L. carniolicum* to the rank of species, based upon research using DNA analysis by İkinci et al (2006). (I must remember to treat my *L. albanicum*, formerly *L. albanicum* var. *carniolicum*, with more respect the next time it flowers.) When considering flower poise, which has frequently been used as a morphological criterion, I have always doubted the wisdom of including *L. candidum* (outward facing flower—openly funnel-shaped or bowl shaped) and *L. bulbiferum* (upward facing flower—cup-shaped) in the same group as the aforementioned species and *LL. chalcidonicum*, *ciliatum*, *beldreichii*, *pomponium*, *ponticum*, *pyrenaicum*, *akkusianum*, *kesselringianum*, *monadelphum*, *rhodopaeum*, *szovitsianum*, *polyphyllum* and *ledebourii*, all of which have either totally or partially recurved flowers. Other, far more illustrious lily classifiers, e.g. Haw (1986) and Baranova (1988) placed *L. candidum* in its own group, i.e. *Lilium*, and *L. bulbiferum* in Section *Psuedolirium*, which includes



*L. maculatum*, which when crossed with *L. bulbiferum* produced *L. umbellatum* (a convincing link I think!). İkinci et al (2006) concluded that “*Lilium* sect. *Liriotypus* (a.k.a. the *candidum* group) is a monophyletic group (containing organisms descended from the same taxons (species) if *L. bulbiferum* is excluded. In other words *L. bulbiferum* is in the wrong section. This is an example where a conclusion arrived at through morphological evidence, by Haw and Baranova, is supported by a conclusion which was arrived at using evidence obtained from DNA analysis, by İkinci et al (2006). However, this coincidence is more the exception than the rule, as the following information on morphology versus DNA analysis suggests.

In the Conference Issue of *Lilies and Related Plants* (2005–2006)

*Lilium ponticum*.

Chris Brickell, in his article: Classification of the genus *Lilium*, produced an excellent overview of classification systems, which were based on morphology. In all he lists 11 major publications, dating from 1830 to 1986, in which classification systems were proposed, most of which were based on flower shape and poise. It would be impossible to discuss all of these classification systems in this comparatively short article, so I would rather focus, briefly, on specific aspects of the system proposed by Comber (1949), which has been referred to in many lily reference books and is one of the systems to which Ikinci et al (2006) refer. In his article: A New Classification of the Genus *Lilium* (*The Lily Year Book* 1949), Comber lists 15 characteristics, from flower poise (pendulous, horizontal, erect) to germination (epigeal or hypogeal, immediate or delayed)—a much wider range of morphological criteria than had previously been used to classify lilies. However, my concern in relation to classifying lilies using morphology is that it cannot be done without the involvement of a degree (or more) of subjective judgement and conjecture. The fact that 11 different classification systems were proposed between 1830 and 1986 would seem to support, albeit inadvertently, my concern. The question that arises from having so many systems to choose from is “which system is the most accurate in relation to the classification of species lilies?” The answer would have to be that they are all problematic, because accuracy cannot be achieved without objectivity, which none of these systems exemplify. However, recent and continuing research—using DNA analysis—should, in the fullness of time, overcome the shortcomings of morphology by producing a science-based objective system that, hopefully, will replace the less than objective morphology-based historic systems. In order to explore the potential for achieving a definitive classification of species lilies, through the use of DNA analysis, I would now like to consider the results of the research work of Van Tuyl et al (1996) and Ikinci et al (2006).

In the research paper, Variation in DNA-Content in the Genus *Lilium*, Van Tuyl et al (1996) used DNA analysis on 31 species lilies, where it was found that, “Variation was not only present between species of different sections but also between species from the same section. Some of the comparisons, among the species identified, make interesting reading, e.g. *L. monadelphum* 71-72%, *L. candidum* 79%, *L. bulbiferum* 82%, *L. pyrenaicum* 74%, *L. amabile* 81%, *L. rubellum* 75-76%, *L. dauricum* 77% and *L. martagon* 78%. For instance, although (according to Comber) both are members of the *candidum* group, *L. monadelphum* and *L. bulbiferum* show a variation of 10%, whereas *L. monadelphum* and *L. rubellum* show less than half of that variation with a 4% difference. (Perhaps that is why a cross I made between *L. monadelphum* and *L. rubellum* produced a generous crop of seedlings.) Similarly, the variation among *L. monadelphum*, *L. candidum* and, non-group member, *L. amabile*

would suggest that, as *L. candidum* and *L. amabile* have closer DNA (despite their different morphological classifications) they should be classified in the same group. I suppose the point I'm making is whether plant characteristics, e.g. flower poise, flower form, bulb shape, leaf arrangement etc, etc, which have been used by lily classifiers to date, should not be revised to reflect—more or less—variation in DNA-content among species lilies as the basis for the classification of lilies. This might address some of the anomalies, e.g. why all but one member of the *candidum* group—*L. polyphyllum*—are native to Europe, North East Turkey and the Caucasus. What a pity *L. polyphyllum* was not included, among the species analysed, as it would have been interesting to ascertain whether the morphological similarities, that led Comber to place it in a sub-group of *candidum* along with *L. monadelphum*, were supported by a similar percentage regarding DNA-content. I have often wondered why *L. polyphyllum* is the isolated member of the *candidum* group? The answer might be contained in the proposal that the Himalayas are the centre of origin of the genus *Lilium* (Patterson & Givnish 2002) with species having spread into the rest of Eurasia and North America. Hence, unlike the rest of its family, *L. polyphyllum* stayed at home, or not, if north eastern Asia is accepted as the origin of the genus (Lighty 1968). Perhaps geographical proximity, like morphology, should take less precedence—than the proximity of DNA—when trying to establish the definitive classification of species lilies.

The research paper on the origin of European lilies: Phylogenetic Analysis of *Lilium* section *Liriotypus* (*Liliaceae*) using Sequences of Nuclear Ribosomal Transcribed Spacers, İkinci et al (2006), lists the morphological classification of *Liriotypus*, a.k.a. the *candidum* group and *L. martagon* by four authors, i.e. Baker (1871), Wilson (1925), Comber (1949) and Baranova (1988). As in the research paper by Van Tuyl et al (1996), İkinci et al (2006) uses classifications based on morphology for reference purposes. Using sectional classifications based upon morphology, İkinci et al indicates that his—and the work of other researchers—“do not support Comber’s (1949) classification of *L. bulbiferum* in the *L. sect. Liriotypus*.” Unfortunately, according to the Strict consensus tree diagram, in İkinci et al’s research paper, there is no bootstrap percentage, BP, for *L. bulbiferum* in relation to the other members of the *candidum* group. However, the BP for *L. bulbiferum* and *L. pumilum* is 78%. Hence, we have a European species that is closely allied to an Asian species, an example, perhaps, of the way in which DNA analysis is likely to change perceptions, despite the physical distribution of lilies. As for *L. candidum*, İkinci et al states, “Our results clearly indicate that *L. candidum* should not be classified in a unispecific section, because this would make the remaining group paraphyletic”, i.e. composed of some but not all members descending from a common ancestor. I am not sure this is a convincing reason

for retaining *L. candidum* in the group of which it is the Lectotype (according to Comber 1949). When comparing the approach of İkinci et al with the approach of Van Tuyl et al (1996), one of the obvious differences is the greater use İkinci et al makes of morphological systems, as a fairly constant reference point against which to compare their–DNA analysis–based–research results.

Perhaps researchers, who use DNA analysis, should ask themselves whether systems based on morphology are potentially more of an obstacle to understanding than a help. In epistemological terms, trying to combine the results of morphology with the results of DNA analysis could undermine the search for accurate knowledge, as the objective procedure of DNA analysis is, to some extent, being measured against morphological criteria that varies, from author to author and are, thereby, not reliable or objective. In essence, if a researcher measured the variation in DNA content of the approximately 100 species of lilies on the planet and represented the results diagrammatically, (as in Fig 2, Van Tuyl et al (1996)), with the species (retaining the existing names, because they are known and for reference purposes) identified along the bottom of the diagram and the % DNA content at the left hand side of the diagram, that would achieve two results: 1. a definitive classification of lilies arrived at using objective methodology that could be validated and where species could be classified in accurate groups based on their DNA and 2. morphology as a means for classifying lilies would become an historical curiosity. This would also make understanding the classification of lilies, which is much more difficult than growing them, easier for the confused amateur gardener like me.

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'Wyattwood' ? an attractive American hybrid

## 'Wyattwood' or what?

*Philip Jones poses the question, 'Wyattwood' or what? In this article about a very attractive American hybrid lily he has grown for many years.*

This summer I enlisted the help of some of the expert members of the Lily Group in an effort to identify an American hybrid lily which I grew from seed in the early nineties. There were four plants at the beginning and these have survived and increased over the years. They appear to be identical in flower formation and colour.

The flower formation of these hybrid lilies is something of a puzzle. They are not reflexed like the Bullwood hybrids and many of the American species, but neither are they bell shaped like *L. bolanderi*. They are, instead, spread out and graceful rather like the roof tops of a Buddhist temple. To identify this lily, I turned for help to George Battle who has a special concern in the revival of the American hybrid lilies. After considering the possibilities, George and I came to the conclusion that the flower was similar to but not exactly the same as

'Oliver Wyatt'. Then George redirected me to Holger Kühne. Holger sent George and me a number of photographs of hybrid Lilies and it became clear that what I had is something similar to 'Wyattwood'. However, the flowers are not as recurved as 'Oliver Wyatt' and they are closer together.

Thanks to Alan Hooker, (Lily Group Seed Distribution Manager), I have been able to consult the seed lists from the early nineties. In the 1993-94 list 'Wyattwood' is described as: "A beautiful, yellow class IV hybrid between 'Oliver Wyatt' and Derek Fox's 'Bullwood Hybrids'; bred by Bill Baker." Bill contributed this seed almost every year during the early to late nineties. It seems very probable that my lily is a 'Wyattwood' seedling of some kind. However, Alan Mitchell (Editor: *Lilies and Related Plants*) took



An overview of 'Wyattwood'.

photographs that indicate an important difference. While the flower formation is similar the colour is more cream than yellow and has a touch of pink in it.

Of course, other possibilities cannot be discounted. 'Oliver Wyatt' was used in crosses made by other seed contributors at that time, as has recently been confirmed. Perhaps other members with long memories may be able to throw light on this beautiful lily. The moral of this short story is that even beginners who grow lilies from seed should not sacrifice clarity to enthusiasm. They should tie labels to pots and flowers. You never know—you might need them some day.



# About the RHS Lily Group

*www.rhslilygroup.org*

The Lily Group is organised under the auspices of the Royal Horticultural Society in order to promote interest in lilies and related plants.

The principal benefits to members of the Group are:

- The **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.
- The **Bulb Auction**. Members' surplus bulbs of lilies and other plants are auctioned in October each year at different venues around the country.
- **Meetings and outings**. Meetings for lectures or discussions are held each year at venues around the country. Outings or week-ends are arranged each year for members to visit gardens of interest to lily enthusiasts.
- **Newsletters**. Three 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**. Articles on plants, gardens and people associated with the Lily Group appear in a booklet which is published every two years.

Details of the current subscription and any of the above are available from the Group Secretary. See opposite the content 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'.
- The **Lily Bowl** is awarded by the Lily Group for the most meritorious single exhibit in a July co-operative display of lilies at an RHS show.
- The **Paul Furse Cup**, first awarded in 1992, for the best fritillary or other plant related to lilies but not of the genus *Lilium* exhibit as part of a Lily Group Co-operative stand at an RHS show.
- The **Voelcker Cup** is awarded to a person in recognition of our international role in promoting lilies.

# INDEX TO PLANT NAMES

## *Cardiocrinum*

*giganteum* 36

## *Fritillaria*

*acmopetala* 33,  
34  
*aurea* **32**, 33  
*affinis* 33, 34  
*albaryana* **32**  
*albaryana* 33  
*arianum* 34  
*armena* 33  
*bithynica* 33  
*bucharica* **32**  
*bucharica* 33  
*camtschatcensis* 33  
*carica* 33  
*caucasica* **33**, 34  
*cirrhusa* **32**, 34  
*collina* 31, **33**  
*collina* var. *lutea*, 34  
*crassifolia* 33  
*dagana* 32  
*davisii* 33  
*delavayi* 34  
*gibbosa* 34  
*glauca* ('Goldilocks')  
33  
*graeca* 33  
*grandiflora* 32, 33, 34  
*guissichae* **32**, 33  
*hermonis*  
subsp. *amana* 33  
*imperialis* 31, 33  
*imperialis* type  
*argentovariegata*  
**32**  
*involutrata* 33  
*kotschyana* 33

## (*Fritillaria*)

*kotschyana grandiflora*  
**32**  
*kurdica* 32  
*latifolia* 32, 33  
*maximowiczii* 32, 33  
*meleagris* 31, 34  
*meleagroides*, 33  
*micchailowskyi* 33  
*olgae* **32**, 33, 34  
*pallidiflora* **33**  
*pallidiflora* 33  
*persica* 33, 34  
*pinardii* 33  
*pontica* 33  
*polyphylla* 86  
*pudica* 33, 34  
*pyrenaica* 33  
*raddeana* Regel 33  
*regelii* **32**, 33  
*rubenica* Wikstr. 33  
*sewerzowii* Regel 33  
*stenanthera* **33**, 34  
*stenanthera* 33  
*thunbergii* 34  
*ussuriensis* 33  
*uva vulpis* 33  
*verticillata* 33  
*whittallii* 33  
*zagrica* 33, 34

## *Lilium*

'Achilles' 8, 9  
'Adonis' 8, 9  
'African Queen' **110**  
*akkusianum* 95, 116  
*albanicum* 95, 98, **114**  
*amabile* 117, 118  
'Anaconda Strain' **75**  
'Angela North' **6**, 17

## (*Lilium*)

'Ariadne' 7, 8, 9, 17  
'Ariel' 55  
Asiatic hybrids 84  
*artwinense* 100,  
*aurantiacum* 98, 101  
*auratum* 17, 41, 69, 81,  
104, 106, 107, 108  
'Barbara' **5**  
'Betty Sturley', **24**, 28  
'Black Beauty' 18  
'Black Dragon' 22  
'Black Heart White' 26  
'Black Opal' 27  
bolanderi 120  
*bosniacum* 95, 98, 100,  
114  
'Bronwen North' **6**, 17  
*bukosanense* 98  
*bulbiferum*  
(and its varieties)  
54, **60**, **62**, **63**,  
**64**, 95, 96, 98,  
101, 113, **114**,  
116, 117, 118  
Bullwood Hybrids 121  
'Canterbury Belle' 80  
'Casablanca' **75**  
CK07-BH04 **29**  
CK08-BH05 **29**  
CK06-HT13 **24**  
CK03-PF1 **23**  
CK07-PF04 **23**  
*canadense* 11  
*candidum* 68, 95, 98,  
100, 101, 109, 113,  
**114**, 116, 117, 118,  
119  
*carniolicum* 95, 98,  
100, 116

(*Lilium*)

*catesbaei* 11, 12, 15, 101  
*chalcedonicum* 95, 98, 100, 101, **115**, 116  
*ciliatum* 95, 98, **115**, 116  
Citronella Group 17  
'Claude Shride' 55, **58**  
*columbianum* 42  
*concolor* 68  
*dauricum* 98, 117  
*dauidii* 17  
'Destiny' 110  
*distichum* 101  
Division VI hybrids  
**67**  
DSC\_0337 **48**  
DSC\_0340 **49**  
DSC\_0355 **49**  
'Elodie' 17  
'Enchantment' 103, 110  
*erythronium*  
*revolutum* 20  
'Eros' 17, 110  
'Fangio'  
**contents page**  
'Fire King' 17  
'First Crown' 16, 17  
*formosanum* 66, 68, 106  
'Garden Society'  
**back cover**  
*georgicum* 95  
Griesbach # 29 **48**  
Griesbach # 31 **49**  
'Gran Cru' 17  
*grayi* 11  
'Hal's Best' **75**  
*hansonii* **committee members page**, 40, 41, 42, 55, 57, 101

(*Lilium*)

*beildreichii* 116  
*henryi* 17, 26, 30, 68, 69, 81, 110  
*henryi* var. *citrinum*, 25, 26, 28  
*iridollae* **10**, 11, **12**, **13**, 14, 15  
*jankae* 95, 100, 116  
'Jupiter' 55  
'Karen North', **111**, 112  
*kesselringianum* 67, 95, 116  
LAs 84  
*lancifolium* 9, 17, **18**  
*lankongense* 8, 9  
*ledebourii* 95, **115**, 116  
*leichtlinii* 17  
*leichtlinni*  
yellow form **18**  
*leucanthum* var.  
centifolium 22, 68  
Lilies of Section  
*Lilium* **94**  
Lilies of Section  
*martagon* **96**  
'Lollypop' 17, **18**  
*longiflorum* **66**, **67**, 68, **69**, 100  
*maculatum* 98, 116  
'Marhan' 62  
*martagon* **54**, 55, 56, 57, 59, 64, **65**, **93**, 94, 117, 118  
*martagon* var.  
*albiflorum* **55**, 56, 95  
*martagon* var. *album* 95  
*martagon* var. *album*  
*superbum* 56, **58**

(*Lilium*)

*martagon* var.  
*caucasicum* 95  
*martagon* var.  
*cattaniae* 55, 56, **58**, 95  
*martagon* var.  
*daugava* 95  
*martagon*  
var. *hirsutum* 95  
*martagon* var.  
*pilosiusculum* 95, 100  
*martagon* var.  
*sanguineo*  
*purpureum* 95  
*medeoloides* 101  
*michauxii* 11  
Mid-Century hybrids  
83  
'Minos' 8, 17  
*monadelphum* 69, 95, **115**, 116, 117, 118  
*neilgherrense* 38  
*nobilissimum* 82  
*notholirion*  
*bulbiferum* 82  
'Nove Cento' 17  
'Odysseus' 8, 10  
'Oliver Wyatt' 121  
'Orestes' 17, 110, **111**  
Oriental hybrids **104**  
OTs 84  
*pardalinum* 18  
*pardalinum* var.  
*giganteum* 25  
*pensylvanicum* 101  
*philadelphicum* 11, 101  
Pixie Cultivars 17  
*polyphyllum* **85**, **86**, **87**, 88, 89, **90**, 91, **114**, 116, 118  
*pomponium* 98, **115**, 116

*(Lilium)*

*ponticum* 100, **116**  
*pumilum* 68, 106, 118  
Purple Fleck  
Type hybrid  
(Charlie Kroell)  
**front cover**  
*pyrenaicum* **half title**  
**page, 92**, 95, 98,  
116, 117  
'RedAsCherry' **58**  
*regale* 62, 68, **109**,  
112  
06RGD06 **48**  
*rbodopaeum* 95, 100,  
116  
'Romeo' 55, **58**  
*rubellum* 81, 117  
Ryrirube hybrids **80**,  
**81, 82**  
*sachalinense* 98  
*sandersonia*  
*aurantiacum* 108  
*sargentiae* 68

*(Lilium)*

*speciosum* 17, 41, 81,  
106  
*speciosum* 'Uchida' **75**  
*superbum* 11  
'Susan Elizabeth' 27  
*szovitsianum* 95, 116  
Table 1 (Article 17) 97  
Table 2 (Article 17) 99  
*testaceum* 100  
'Theseus' **7**, 110  
Trumpet strains 83  
*tsingtauense* 56, 101  
'Tweedledee' 17  
'Tweedledum' 17  
*umbelatum* 116  
*wardii* 68  
'Wyattwood' **120, 121**  
'Ypsilanti' 26, 27

*Trillium*

*chloropetalum* **21, 22**  
*rivale* 21  
*roseum* 21

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# Guidelines for authors

Contributions for publication in the Royal Horticultural Society Lily Group yearbook, *Lilies and Related Plants*, are invited on any aspect of lilies and related plants—growing, cultivation and breeding, species and cultivars, history, people who have made a significant contribution to the subject and nurseries or gardens. Any questions concerning articles can be addressed to the Editor, Alan Mitchell at: [massiec@tiscali.co.uk](mailto:massiec@tiscali.co.uk) or at Hallfield, Star of Markinch, Fife, KY7 6LB, UK; telephone +44 (0)1592 759255.

It is a condition of acceptance that contributions are the original work of the author(s) and that the Editor should be notified if they have been previously published or are under consideration for publication elsewhere. The Editor reserves the right to refuse any contribution and to make minor textual changes without reference to the author.

Contributions can be submitted in any format, hand-written, typescript, double-spaced on one side of the paper, or, preferably on floppy disc or CD-rom, in formats compatible with Windows (Word) or Mac (Quark/InDesign); if in the latter format a hard copy should also be supplied.

High quality illustrations, colour transparencies, prints (in colour or black and white), or A5 high-resolution digital pictures (these should be at least 300 lines, dots or pixels per inch) are welcome. Authors must remember that it is sometimes necessary to print an illustration in black and white at the discretion of the Editor. Maps, diagrams and line drawings are also welcome and should be drawn clearly in black ink within a minimum base line width of 110mm. If artwork and illustrations have previously been published elsewhere or are the property of another, it is the responsibility of the author to obtain any permission needed for reprinting, and to forward a copy of the permission to the Editor. Authors should also be aware that, as the lead-time for an issue can be up to two years, any illustrative material may be in the care of the Editor for a long period of time.

The present Editor's policy is to publish the author's original words as far as possible but should any changes be necessary the author will be consulted. Proofs will not normally be sent for approval prior to publication.

References should be cited in the text referring to a list of references at the end of the article.

Where the Editor considers it necessary he will refer manuscripts to members of the Lily Group Committee for their consideration and advice.

