

The Bulb Garden



~ Gardening with Bulbs ~

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Once and Future *Scillas*

Jane McGary

“Scilla” is a plant name of great historical depth. It occurs in the Classical Greek writing of the poets Theognis and Theocritus, although they appar-



ently meant a plant we know under another name (perhaps *Urginea maritima*, the “sea squill”). European botanists of the modern era have

Above: A former *Scilla*, now *Hyacinthoides lingu-
lata*. Right: *Scilla messeniaca* be-
comes *Schnarfia messeniaca*. Pho-
tos by Jane
McGary.

applied it broadly to many plants in the Hyacinthaceae (hyacinth family, split off recently from Liliaceae), especially those with a spike or raceme of starry blue flowers arising from a true bulb. These days, however, the name is causing gardeners a good deal of confusion, and this note is meant to help sort out the names once found in lists and those we’re likely to encounter in future.

Separated from *Scilla* decades ago

but still known to some gardeners under that name are the “bluebells,” *Hyacinthoides*, which have also been called *Endymion*. The best-known of these are the English bluebell, *Hyacinthoides non-scripta*, and the Spanish bluebell, *H. campanulata*; the latter is invasive in gardens, and hybrids between the two even more so. In *Hyacinthoides* we also now find *H. reverchonii*, *H. italica*, and *H. lingulata*. All are medium-sized spring-flowering species except the last, which is a little, rather tender fall-flowering gem for containers.

In a post on the PBS forum, Julian Slade wrote: “Recent scien-



tific studies using DNA sequencing technology have shown that what we know as *Scilla* actually appear to have multiple evolutionary origins. Therefore it seemed reasonable to recognize each coherent group as a separate genus.”

(continued on page four)

Partners for the Waltz of the Seasons: Gardening with Spring-Flowering Bulbs

Judy Glattstein

My husband, an engineer, says it is important to first define your terms. “Spring-flowering bulbs” is the easy one: time of year and lumpy underground storage element. (Let’s not get overly pedantic, just accept *bulb* as including bulbs, corms, tubers, and rhizomes.) It is *gardening* that is open to interpretation.

What’s a garden? A place where we grow plants. Fair enough, but consider the options and possibilities. Is the garden formal or casual, located in a city or the country, sited in sun or in shade? Each element supplies its own tweak to the design. What the geophytes contribute are early flowers and extended absence, factors that influence where to grow and how to use them. Consider Keukenhof, the Associated Bulb Growers’ display garden in the Netherlands—lots of geophytes planted anew each autumn, producing massive blobs of color, with the garden closed for the remainder of the year when the tulips, daffodils, hyacinths, grape hyacinths, and more have finished their flowering display.

Is this a garden? Yes. Is it one I wish to emulate? No. Lovely to visit, but *visit* is the operative term. Closer to my home in New Jersey is the New York Botanical Garden. The Seasonal Borders (one is 184 feet long, the other is 86 feet long) have traditionally

featured a display of tulips in the spring followed by annuals for the summer. Students from the School of Professional Horticulture rip out the annuals in fall and plant the tulips bulbs, which are in turn dug and discarded, to be replaced by a new design of annuals.



Formal displays at Keukenhof Gardens (above) and the New York Botanical Gardens (below) are lovely to *visit*, but perhaps not realistic gardening models for most of us! Photos © by Raymond E. Miko and Judy Glattstein, respectively.



I don’t have staff and I don’t have the budget for this type of display that suits public gardens where visitors come once, come occasionally, come now and then. The delight of my own garden is that I see it day after day, in morning, at midday, as dusk falls. While I love the geophytes I’ve planted, they’re a component of the garden, not its totality. Accordingly, I find that devoting 10 to 15 percent of the space to geophytes and mingling them with herbaceous perennials, ground covers, and annuals best serves my taste. (The geophytes also blend well with weeds, but let’s not go there—garlic mustard, *Alliaria petiolata*, and jewelweed, *Impatiens capensis*, will always be with me.)

The NYBG Seasonal Borders were redesigned in the fall of 2008 by Piet Oudolf and Jacqueline van der Kloet. Oudolf is well-recognized for his somewhat naturalistic designs incorporating mixed plantings of perennials for their attributes beyond flowers: foliage, in fruit, winter appearance, and more. Van der Kloet has been developing planting schemes for geophytes

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Partners for the Waltz of the Seasons (cont'd)

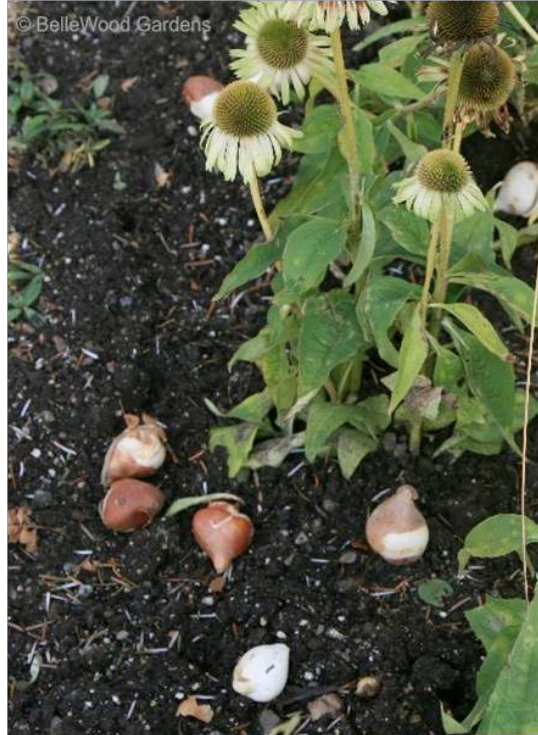
(continued from previous page) that intermingle genera and their flowering times. Think of a somewhat compact intermingled grouping that spreads, like ripples on a pond. It intersects with the fringes of the adjacent group that in its turn reaches the first group's center. Per square meter, she recommends 12 to 15 bulbs and 7 or 8 perennials.

At NYBG the network of geophytes—daffodils and tulips, scilla and muscari, colchicum and allium, and others—is intertwined with herbaceous perennials—sedum and echinacea and grasses and more. It looked good last spring and will improve as it settles in for a couple more years.

And in a garden of one's own? Try daffodils tucked between peonies, daylilies, and Siberian iris in a sunny border, mixed with ferns, hosta, or brunnera in the shade. Mix snowdrops, *Galanthus* species and cultivars, with winter aconite, *Eranthis hiemalis*, their small and early flowers among

the matted brown leaves of winter's mulch, then disappearing back un-

Those of us who don't have a staff to manage the constant planting and replanting of our gardens might appreciate the NYBG's new, four-season approach to planning a garden. They intermingle geophytes with herbaceous perennials to ensure constant bloom without constant effort. **Right:** Tulip bulbs lay ready for planting next to echinacea. **Bottom left:** anemone, muscari, and a just-opening daffodil. **Bottom right:** daffodils and muscari bloom while sedum prepares for its fall show.



teris hexagonoptera, and lungwort, *Pulmonaria* cultivars. One of the most charming combinations I've ever seen was *Cyclamen coum* overplanted with *Ajuga reptans* 'Tricolor', the pink shuttlecock flowers of the cyclamen dancing over the multi-hued ajuga leaves touched with gray, pink, and bronze. Find your geophytes partners for the waltz of the seasons. In nature they intermingle with the other plants of meadow or woodland. Offer them the opportunity to do so at home in your garden.

Editor's Note: For more on van der Kloet's approach,

check out this link: www.youtube.com/watch?v=ZHJMXROeC8 (the interview is in Dutch, but you can see perennials intermingling with bulbs). For more about Keudenhof and the NYBG,

derground disguised by arising *Geraniums*. Try little deciduous ferns such as broad beech fern, *Phegop-*

follow these links: www.keukenhof.nl/ (an English-language site) and <http://www.nybg.org/>.

Once and Future *Scillas* (cont'd)

Hyacinthoides was separated from *Scilla* some time ago...



Hyacinthoides italica. Photo by Mary Sue Ittner.



Hyacinthoides non-scripta. Photo by Bob Rutemoeller.



Hyacinthoides reverchonii. Photo by Mary Sue Ittner.

(continued from page one)

The new names were proposed primarily by Franz Speta (see References) and can be summarized as follows.

PBS members in warm areas or those who have heated greenhouses will be interested in the “scillas” from sub-Saharan Africa. The new genus *Merwillia* includes the former *Scilla natalensis*, *S. dracomontana*, and *S. kraussii*. Adapted to summer-rainfall climates, each bulb produces a single flowering stem annually, with light-colored papery seeds. The genus *Spetaea* has just one species, *S. lachenaliiflora* from the Cape of Good Hope; it is evergreen and found at higher elevations. *Schizocarphus nervosus*, also the only species in its new genus, is summer-growing but produces multiple flowering stems and has black, ovoid seeds. Monotypic *Pseudoprospero firmifolium* is distinctive in having a side branch on the flowering stem and is summer-growing. Finally, *Scilla lazulina* from Zimbabwe has not yet been assigned a new genus name. DNA studies suggest it is the most primitive plant in this group (I assume it is different from *Hyacinthella lazulina*).

Most of the former scillas from Europe, North Africa, and Asia seem fairly cold-hardy (surviving about 20°F/−7°C in my bulb frames). A curious distribution is that of the proposed genus *Barnardia*, embracing *Scilla numidica* from North Africa and *S. japonica* from East Asia. These are fall-bloomers with pinkish rather than blue flowers, but the plant widely distributed in North America as *S. numidica* is in fact *S. scilloides*, which I understand to be possibly conspecific with *S. japonica*.

Another fall-blooming group is called *Prospero* by Speta and includes what were the familiar *Scilla autumnalis* and such rarely grown plants as *S. obtusifolia*, *S. intermedia*, and *S. hanburyi*. Their scapes emerge before the leaves are fully developed, and the flowers are not subtended by bracts or bracteoles. Most of them are more pink than blue, but *P. autumnalis* is variable and can be near-blue. It is the only one of them that increases well for me, primarily by self-sowing. All ripen their seed very quickly after flowering; some of my *P. autumnale* were grown from seed I collected in Greece from populations that were still flowering strongly.

The familiar *Scilla peruviana* is placed in a genus *Oncostema*, along with similar plants such as *O. sicula* and *O. hughii*. These make big rosettes of leaves that emerge in fall, and the protection of a shrub helps get

(continued to next page)

Once and Future *Scillas* (cont'd)

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them through the winter without frost damage; rabbits tend to eat them here, though. Their inflorescence is showy and the florets typically dark blue with large bracts. I've heard *O. peruviana* can be aggressive in California gardens, but it is well-behaved here in Oregon.

Another group that produces a lot of foliage is that typified by the former *Scilla verna*. It has been dubbed *Tractema*, with such members as *T. verna*, *T. monophyllos*, and *T. lilio-hyacinthus*. These are good subjects for temperate gardens. Their large bulbs form dense clumps, flowering faithfully without lifting for many years, and I haven't found unwanted seedlings. *T. monophyllos* is a particularly beautiful blue.

"The splitting goes a bit over the top, it seems to me, when the western Asian species are confronted."

The name *Autonoe* is being applied to a group typified by former *Scilla haemorrhoidalis* and *S. madeirensis*: "distinct in having orange to purple, fleshy fruits and unique in the Hyacinthaceae in not producing nectar" (Julian Slade). I have grown only the first-mentioned of this group and lost it to freezing.

The splitting goes a bit over the top, it seems to me, when the western Asian species are confronted. *Othocallis* comprises former *Scilla siberica*, *S. miczenkoana*, and *S. rosenii*, though I thought if anything stayed a *Scilla* it would be the first of those. These are all very winter-hardy plants, and indeed *S. rosenii* seems to need a serious winter dormancy to thrive. A clearly identifiable group centered on Iran, *S. greilhuberi*, *S. hohenackeri*, and *S. gorganica*, is being called *Fessia*. These have rather few, large flowers and copious, lax foliage; the tepals reflex somewhat and the large anthers are prominent. I find *S. greilhuberi* a good garden plant in a well-drained site, but have the others only in the bulb frame. *Scilla bithynica* is very similar to *S. siberica* but has, according to Speta, "seeds without an appendage" so gets its own genus, *Pfosseria*. Another monotypic genus, *Zagrosia*, is proposed for *S. persica* on the basis of "scapes remaining rigid, capsules dry and papery" (Speta); this is a plant that I like a lot, though I haven't yet put it in the garden, where its numerous little flowers of bright blue would be pretty among rocks.

Finally, the new classification identifies a group in the eastern Mediterranean to Caucasus and Iran closely allied to *Bellevalia* and *Muscari*. Here Speta sets up a mono-

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No longer *Scillas*...



Above: *Oncostema hughii*. Photo by Susan Hayek.
Middle: *Oncostema peruviana*. Photo by Bob Rutemoeller.
Bottom: *Barnardia scilloides*. Photo by John Lonsdale.



Once and Future *Scillas* (cont'd)

(continued from page five)

typic genus for *Scilla hyacinthoides* and calls it *Nectaroscilla*. His *Chouardia* embraces *S. litardierei* and *S. lakusicii*; the former is a name often misapplied to *Hyacinthoides hispanica* in the trade, but the real thing is a decent garden plant. I have never seen the latter. The rather horrible name *Schnarfia* is given to *Scilla messeniaca* and *S. albanica*; I have not seen the latter, but the former is a small, attractive species, not yet tried outdoors here.

This leaves the name *Scilla* for *Scilla bifolia*, a widely grown and enthusiastic garden subject, along with the former genus *Chionodoxa*, whose species have moved in and out of *Scilla* over the years and are very confused in horticulture.

It remains to be seen whether, or to what extent, this reclassification is accepted, and if so, how quickly it enters horticultural usage. I'd like, however, to en-

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courage gardeners to try more of these plants, under whatever name they land. Fear of the Spanish bluebell too often drives gardeners away from anything called “scilla,” when in fact many of the species mentioned above are restrained in the temperate garden, and some of them are actually difficult to maintain. Almost every one supplies lovely color, and among them are species flowering in almost any month between September and May. They range from alpines tolerant of deeply cold winters to species adapted to the subtropics. And almost all of them are very easy to grow from seed, which is often available because it is generally set in good quantity and is easily harvested.

Editor's Note: Interested (and bilingual!) readers might wish to consult Jane's source: Speta, Franz. 1998. *Systematische Analyse der Gattung Scilla L. (Hyacinthaceae)*. *Phyton (Horn)* 38:1-141. For further information, see <http://tolweb.org/Hyacinthaceae>.

Still a *Scilla*!

This is not the common *S. bifolia* seen in Central & Eastern Europe, nor the form generally found in the horticultural trade, but a gorgeous local form of the most variable species, *S. bifolia*, which has been named *Scilla rosea* Lehm., also *S. bifolia* var. *taurica* Regel.
Photo by A. M. D. Hoog.



No Longer *Scillas* ...

Top: *Tractema ramburei*. Bottom: *Hyacinthoides vincentina* (syn. *H. mauretanica* subsp. *vincentina*). Photos by Jane McGary.



Daydreams from the Garden Room

Our newest columnist, Marguerite English, gardens in Descanso, CA. In between busy days filled with work (she and her daughter have just started up their own business!), Marguerite seeks out her garden for a little solace. Here she shares the ups and downs of that garden with PBS members. — Ed.

I have a special place to daydream and watch the flowers grow. It is a hybrid room: part greenhouse, part conservatory (if only the walls and floors were completely finished!), and part workshop. I moved a rug, easy chair, and reading lamp there to make napping or reading plant books and catalogs fun. As I grow older, and need as much rest time as work time, this room has become my favorite hangout, especially when the winds howl outside.

Dichorisandra thyrsiflora “Blue Ginger” showed spectacular blooms, deep blue (my favorite flower color), in the plant room this fall. The *American Horticultural Society A-Z Encyclopedia of Garden Plants* describes this plant as a rhizomatous perennial, so I categorize it as a geophyte although that may be borderline. It is not a ginger, but a member of the Commelinaceae family and originates in Brazilian woodlands. Fleshy orange fruits form from the blossoms.



Dichorisandra thyrsiflora – individual blossoms not yet open. Photo by Marguerite English

My first bloom started opening around the beginning of October, was fully open by the end of the month, and stayed attractive well into November. A large raceme with many small blossoms develops at the tip of each 3- to 4-foot stem. Blooms develop throughout the fall and are still showing in January. This is Blue Ginger’s third year here, and it has not previously bloomed. My two plants occupy two gallon containers located near the east windows.

I usually feed them with epiphyllum food in about September and January. They sit under the epiphyllums and get food when I happen to be feeding those plants. I treat most of my plants carelessly and don’t have an efficient feeding schedule. The room temperature ranges from 45°F during winter to an occasional 100°F during summer. This is definitely a must-have border plant if you live in USDA zone 10, and a greenhouse plant otherwise! (Available from Logee’s.)

Oxalis bowiei also provides gorgeous blooms every fall. Last year, after being disappointed with the number of blooms, I moved my plants from five-inch plastic azalea containers into one-gallon clay standard-depth containers. They liked the deeper containers and came through dormancy just fine. As soon as they showed green shoots, I fed them and moved them

to the bench under the plant light, where they also receive filtered light from the east windows. Individual blossoms drop after a few days, but the plants keep putting out color for several



Oxalis bowiei. Photos by Marguerite English.

weeks. This plant is native to both capes of South Africa. I have used plastic over the years because clay containers dry things out significantly during our hot, dry summers. The move to clay was beneficial for this oxalis, and the drying-out problem isn’t significant with dormant bulbs, so I’m experimenting with some other bulbs in clay this year. (They will be available from the bulb exchange when next I transplant.)

Cyclamen graecum lives outside near a boulder in a semi-shady raised bed in the garden. I ordered three last year after reading Jane’s recommendation that they should do well in southern California. They entered dormancy during the summer and survived several weeks of dry 90 to 105 degree weather. I forgot about them until starting the fall cleanup, but there they were! The plants are tiny but attractive, with typically decorative leaves. I am anxious to see how they survive over this winter and how they bloom. Thanks, Jane, for making that recommendation in your article, and thanks, Robin, for being my “cyclamen source.” (Available from Robin Hansen’s catalog.)

Finally, how could I have Christmas without a selection of the ubiquitous red and white florists’ cyclamen? Every nursery and drug-store sells them during the holiday season. I buy several, the tinier the better, and then transplant them into larger containers as soon as I get them home. Each year, my collection grows, although I let some of them dry out a bit too much this summer and they didn’t come back from dormancy.



Florists’ cyclamen. Photo by Marguerite English.

A Warm, Well-Lighted Place

Robin Hansen

Robin gardens in North Bend, Oregon just east of the Pacific Ocean on a property sheltered by dunes and conifers (slightly colder and hotter than USDA zone 9). She grows and sells Cyclamen and a few other Oregon native plants. To ask questions or request her plant list, send an E-mail to robin@hansennursery.com. — Ed.

When I moved back to the southwest coast of Oregon 13 years ago, I left behind a small 8 x 10 fiberglass greenhouse with lights, heat, fan, and benches. It had no place for me to sit, and in the dead of winter in the Willamette Valley, I wouldn't have wanted to, but I loved to go out in the worst weather. I

would shut the door behind me, then let my plants and seeds work off the gray mood brought on by too much winter sky.

Two years ago, I had OBC Northwest in Canby make a greenhouse for me to fit next to the house. I made plans to heat it and put a permanent covering on it. Finally this fall, I began framing the ends and making doors so I could at least get 6-mil greenhouse poly on it and start using it. It was a case of do something — anything! — now, or it might not

get done for some time.

My father (who spent most of his working life as a longshoreman, but was a carpenter at heart, thanks to his Danish father, a union carpenter here in Coos Bay) and I put together my very first poly house, 20 x 48 feet 19 years ago. Over the years we built another one and reconstructed the first poly house after I moved it to North Bend. So I started in on this greenhouse after a lag of several

sawed and every nail I pounded, some technique my father used or some tip he gave me surfaced to guide the building of this greenhouse. I like to think Dad and I just built another one together, even though he's been gone a year this past February.

I have some different plans for this house, among them passive solar heat, benches of Schedule 80 rather than Schedule 40 PVC, and an aisle wide enough to hold a chair. Or it will be wide enough, since I made sure the doors can accommodate the garden cart. The bench tops will be the old cedar boards I've been saving from a fence I tore down. The last PVC benches of Schedule 40 worked well in the small house but would be wobbly in a 10 x 24-foot structure. The passive solar heating will come from black garbage cans full of water. When I



Robin's greenhouse, being "put together freestyle" — just like her dad did it!

was talking to one of the engineers at the office, he suggested using Epsom salts in solution, since that would retain heat many times better than plain water. Eventually, when the hard covering replaces the Tufflite 4 poly, roof vents will be installed, and I'll pipe water in, but for now I have a usable, warm greenhouse. This morning's frost says it's time to move in the scented geraniums ... even if the floor has yet to be leveled and covered!

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Board of Directors Meeting, August 2009

Post-holiday greetings from your Board of Directors! We hope you all had a safe and happy holiday season!

We are pleased to report our membership slowly but surely continues to grow. As of the November meeting we had 175 members and several more have joined since, a trend we like to see. We are excited to report that PBS just recently got its first members from Japan and China!

We all owe David Pilling a debt of gratitude for improving the website functions that have made joining and BX payment effortless.

President Jane McGary continues her efforts to organize regional botanizing tours as a way for us to meet one another. Those of you planning to attend the NARGS conference in Salida, Colorado, in July 2010 might begin considering a PBS get-together on the preconference day in Denver. We will discuss this further at our next meeting and get back to you.

We're beginning to look at ways to divide the work load of the Bulb Exchange. If any of you have suggestions for effective and efficient ways to accomplish this, please send them to BX Director Dell Sherk at ds429@comcast.net. Dell has set a high standard from which we have all benefited over the years, a standard we wish to maintain. Big thanks to Dell!

From all reports at the meeting, PBS continues to function smoothly. Thank you, Jim Waddick, for nominating the current slate of officers who have agreed to serve for the next two years.

We wish all of you (and your gardens) a wonderful 2010!



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Treasurer's Report

BALANCE 7/1/09 \$ 22,975.78

INCOME

U.S. Members	\$ 260.00
Overseas Members	\$ 200.00
Contributions	\$ 26.00
BX Receipts	\$ 1,639.61
Investment Results	\$ 15.87
TOTAL INCOME	\$ 2,141.48

EXPENSES

BX/SX Expense	\$ (1039.62)
Board Conference Call	\$ (45.84)
Total Publications	\$ (1,185.00)
Postage	\$ (38.49)
Misc. PayPal Expenses	\$ (155.47)
TOTAL EXPENSES	\$ (2,464.42)

BALANCE 9/30/09 \$ 22,652.84

It's time to renew !

We appreciate your support—we would hate to lose you!



~Gardening with Bulbs~

Renewing is easy. You can renew **ONLINE** (\$20 U.S., \$25 international) via PayPal. Just use the button on our membership page,

<http://www.pacificbulbsociety.org/membership.html>.

Be sure to contact Patty (patrylis@aol.com) if any of your contact information has changed.

You can also mail in your renewal. Please direct it to Patty Colville, 1555 Washburn Road, Pasadena, CA 91105.

Questions? Call Patty at (323) 254-9831. If any of your contact information has changed, please update it on this form, cut it out, and send it in with your payment.

Name: _____
Address: _____
Telephone: _____
Email: _____

Thanks again for your continued support of the Pacific Bulb Society!

Feed Your Plants' Nutritional Needs

Jim Shields



Jim Shields is a retired biochemist now growing rare bulbs, clivias, and daylilies in the cold Midwest (Westfield, Indiana). He runs a small family business, growing about 400 named varieties of daylilies, including about 40 of their own introductions. Shields Gardens also grows and sells rare and exotic bulbs. To learn more about him and Shields Gardens, visit <http://www.shields-gardens.com/index.html>. Be

sure to check out his blog. To truly appreciate Jim's need for good fertilizer, look at the photos showing his vast garden! — Ed.

Bulbs are adapted to survive harsh climates. They store energy during their growing season, when conditions are good (or at least adequate) for growing. When the season changes and the conditions are unfavorable, the bulb goes dormant. Dormancy is characterized by losing the leaves and any above-ground stems, but below ground the bulb is often far from inert. Next season's flowers are developing; and if the old roots are shed, new ones are developing.

This means we have to think about the plants' nutritional needs all year around, not just during the often brief rush of the growing season. This is especially true for bulbs native to cold, wet climates, where the roots may be active through the dormant period.

The adaptations to harsh, especially to arid, climates also tend to leave the bulbs relatively unprotected against pathogenic bacteria and fungi. Excess moisture around the bulb or its roots during the dor-

mant season can encourage growth of these pathogens. When we grow exotic bulbs in the alien environment of our own backyards or greenhouses, we increase their risks of succumbing because of unusual growth of pathogenic bacteria or fungi.

Needs of Bulbs

Horticulturists, such as the bulb growers in the Netherlands, estimate the fertilizer needs of their bulb crops by analyzing samples of the mature plants for nitrogen, phosphorus, and potassium. *Narcissus poeticus* bulbs in full leaf analyze for about 16 percent nitrogen in the whole plant. Potassium levels will be somewhat lower than the nitrogen analysis, and phosphorus will be the lowest of these three. Bulbs should be fed so that the macronutrients are available in the fertilizer in the same ratio as they are incorporated into the plant tissue.

Nitrogen

Nitrogen (symbol N) is one of the essential macronutrients for all plants. The gaseous form that makes up



The mad scientist at work! Photo by Irma Shields, Jim's wife.

80 percent of our atmosphere, N_2 , is almost totally inert. To become available to plants, it must be converted to some other form. Commercial fertilizers make use of a combination of any of several nitrogenous compounds: ammonia, ammonium salts like ammonium sulfate $[(NH_4)_2SO_4]$, urea $[NH_2-CO-NH_2]$, and ureaform $[NH_2-CO-NH-CH_2-NH-CO-NH_2]$ are most often found.

Less common and more expensive are nitrates, such as potassium nitrate $[KNO_3]$. Ammonium nitrate $[NH_4NO_3]$ is a common bulk fertilizer used in agriculture.

Plants can take up nitrate directly and use it efficiently in metabolism to generate amino acids, proteins, *(continued to next page)*

Feed Your Plants' Nutritional Needs (cont'd)

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and nucleic acids. Bacteria and fungi usually do not use nitrate, although some denitrifying bacteria can destroy nitrate, converting it back the gaseous nitrogen.

Plants cannot efficiently use ammonia or ammonium salts. They cannot use urea or ureaform directly at all until it has broken down into ammonia. These compounds are, however, readily metabolized by bacteria and fungi. Feeding your bulbs, especially those from arid climates, with ammonia- or urea-containing fertilizers will primarily benefit pathogens in the soil rather than your bulbs! It is always better, in my opinion, to use plant foods that have relatively more nitrate nitrogen and less ammonia nitrogen. During the leaf stage of growth, nitrogen as nitrate is very important for optimal leaf development.

Phosphate

The element phosphorus (symbol P) is also an essential macronutrient. It is a major component of DNA and of RNA and is a crucial participant in the energy metabolism of all living things. In spite of this, it is needed in lesser amounts than the other two macronutrients. Moreover, it is more stable in the soil than nitrogen and potassium because it readily forms insoluble compounds with soil components, particularly with silicates and clays.

Excessive use of phosphate can adversely affect growth by removing essential micronutrients, particularly iron, from solution. Iron phosphate complexes are very insoluble at most soil pH values and hence are not available to plants.

Potassium

Often referred to in horticulture as "potash," potassium (symbol K) is a very soluble element related to so-

dium. Potassium is used by bulbs in larger amounts than is phosphate, and the plant needs to take up more potassium from the soil.

Because potassium, like nitrate, is very soluble and is poorly retained in soils, both N and K must be fed almost continuously to bulbs in active growth. Of course, bulbs that require absolute dryness during dormancy cannot be given fertilizer. Even if it is in the dry soil, the plant roots cannot absorb it.



Jim's automated, drip-irrigation fertilization system at work in his large Clivia House. Photo by Jim Shields.

My Practices

I grow my plants in greenhouses, but the smaller greenhouses do not pose a problem with feeding. It is the large Clivia House, with over a thousand plants, that I have automated with a drip irrigation system. The pots on the benches are fitted with individual drip tubes and the system has a fertilizer solution injector pump driven by the flowing water. In summer, I make up the concentrated stock fertilizer solution about weekly. In winter, with watering on a reduced schedule, one 2-gallon tank lasts about three weeks. I still have to water the many pots sitting on the floor by hand. In my hands, no system is quite perfect.

Recommendations

These should be taken lightly, as conditions vary drastically between native

habitats, Southern California or Italian patios, and the greenhouses in the northern USA and Europe.

I recommend using a soluble plant food with no organic components. The nutrient balance of N-P-K should be something like 15-5-10 or, as I use for convenience sake myself, 20-10-20. Be sure the essential micronutrients (trace elements) are included. I water at 100 p.p.m. nitrogen with every watering. This is roughly equivalent to ½ level teaspoonful of a 20 percent N plant food in 1 gallon of water.

Gardening with Bulbs

Those of you who recognize this beautiful blue flowering geophyte might identify it as *Scilla siberica*—but you'd be wrong! Jane McGary explains the separation and renaming of the genus *Scilla* in her article beginning on page 1. Photo of *Othocallis siberica* by Jay Yurch.



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