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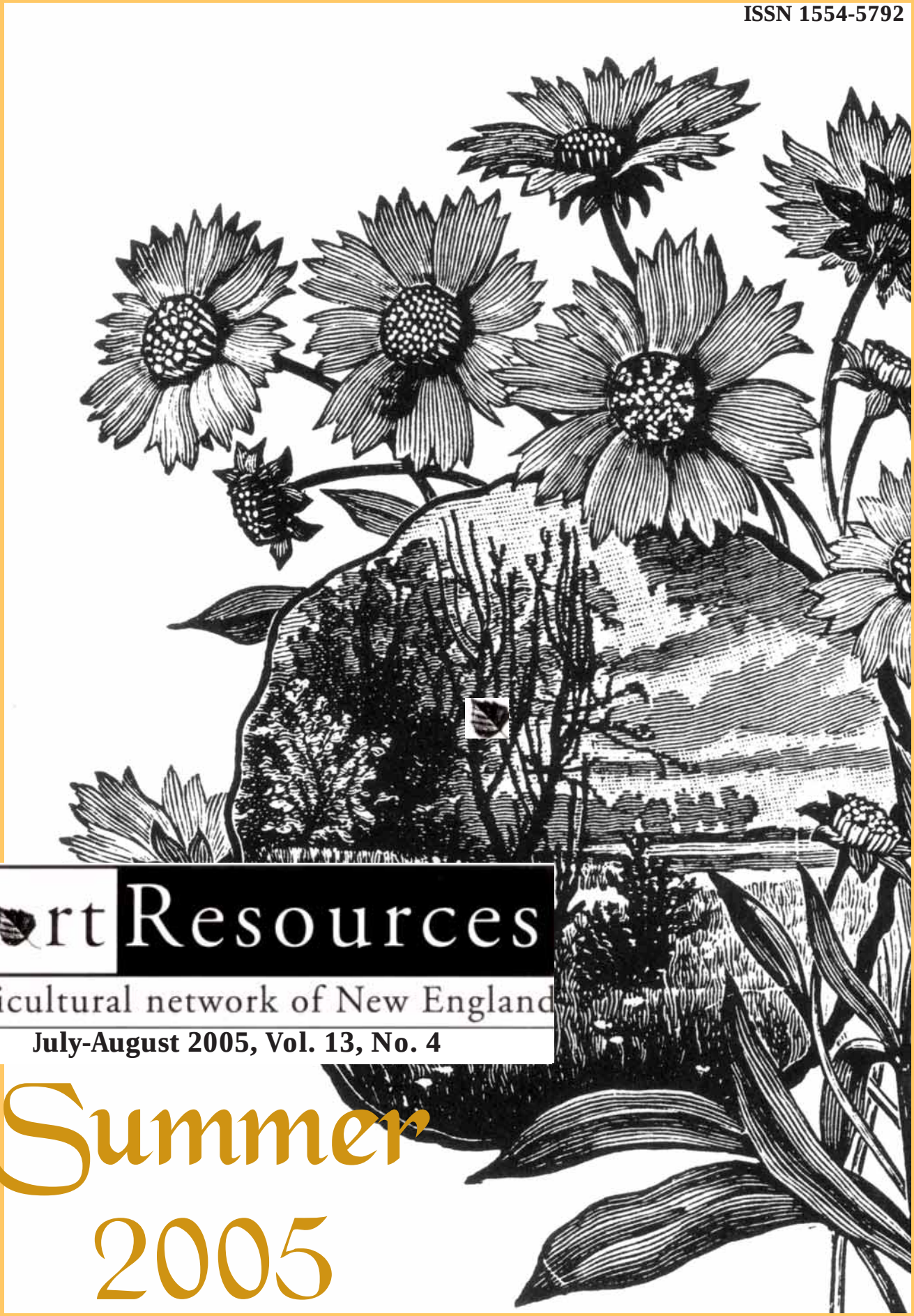

hortResources

horticultural network of New England

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About HortResources

HortResources is a non-profit network of horticultural enthusiasts in the Northeast and beyond who serve as resources to one another. Members include individuals, businesses, and non-profit institutions. The *HortResources Newsletter* appears six times yearly, with January-February as the first issue. The *HortResources Calendar*, available at *hortresources.org*, is the most complete horticultural calendar of events available for New England. Membership starts in January and all back issues are free on-line to members.

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Heliantus giganteus

Elizabeth Cole owned a 5-acre property called Moss Hill Farm in Sherborn on the Charles River when she founded HortResources. Now she lives in a congested suburb of San Francisco and the size of her garden has dropped precipitously — although not her ambition to have a great one. Elizabeth writes about the essentials of...

MAKING A VERY SMALL GARDEN LOOK BIG AND FEEL *peaceful*

Garden Tour: The Tiny Garden Writ Large

Elizabeth F. Cole, M.D.

Even a very small garden can have a large garden feel. It is so important for the gardener to consider the design of a garden from several viewing sites. I designed my enclosed garden of 34 by 47 feet to be enjoyed from the upstairs bedroom and bathroom as well as from within. The aerial view is as important to me as being in the garden.

The rear yard of the 80-plus-year-old Arts and Crafts development south of San Francisco in which I live is surrounded on the north and south by tall lateral-board fences and at the rear by rustic redwood fencing. Within that space, there are four color-coordinated gardens. Trellised vines blend two of the fences into the garden: *Passiflora jamesonii* 'Coral Seas' and *Hardenbergia violacea* 'Happy Wanderer'. The vines work to deaden the noise of the neighbors and the street. Along the back fence are numerous types of *Ceanothus*, California lilac, in blues and purples and white; unfortunately for New Englanders it is hardy zones 7-10. Hiding the neighbor's deck are the two big plum trees, into which the passion flowers climb, from which I make jellies for friends and for my doctors, who keep me well enough to cook it.

In the center of the space is a Chinese hackberry (*Celtis sinensis*), which is hardy in zones 5 - 9, carefully chosen to tolerate the clay soil, to have limited root invasiveness, and to grow rapidly to provide shade. The circle around the hackberry is defined by redwood Bend-a-Board, as are the garden borders. The bed resembles an old-fashioned, symmetrical herb garden with two golden yews pruned into crescents, two large black boulders of foamy lava from the western Sierras that had been exposed by placer mining, and clusters of dwarf golden tarragon as edging. Dwarf green tarragon is planted inside the circle made by the golden yews. Completing the

Continued following page.

Small garden. *Continued from previous page.*

picture around the tree is: a dense, flat, bright-green ground cover from South America, *Azorella trifurcata* 'Nana'; a violet-blue circlet of lobelia; and, *Acaena saccaticupul*a, a beautiful and delicate, blue-grey ground cover in the rose family from New Zealand.

I am surprised at how many herbs I have throughout the garden. They include pygmy thyme and golden pygmy tarragon (the yellow in the circle), society garlic, chives, variegated strawberries, purple oregano, purple sage in a pot under a plum, dark-green dwarf tarragon under the golden junipers, mints, white and purple nepeta, purple oregano, chives, and rose geranium (pour hot apply jelly over one leaf per jar), yellow and green variegated 'Oriental Limelight' artemesia, and six salvias — blues and violets, red and coral. The temple garden also includes many favorites from New England days: *Tiarella cordifolia*, ladies' mantle, ferns, black ajuga, and lewisia.

Originally having a slight but relentless slope down towards the northwest corner, three berms have been created. The first was the central bed, which was raised to provide improved soil for the hackberry. The hill in the "temple garden" was created to balance the large pomegranate in the opposite corner. The berm along the back fence also helps to screen out noises.

Pomegranate flower

The gardens are perfectly set off by a lawn of Kentucky blue grass and perennial rye, outlined gracefully with Bend-a-Board. The yard was finally rid of Bermuda grass by digging 1 1/2 feet deep, after five sessions of Roundup failed to do the job. I mow it myself with a Brill battery-powered mower that is quiet as a dove and which produces no noxious exhaust. [See the Brill web site at www.brill.de for the mower and other battery-operated garden tools.]

Water features provide play opportunities.

Birdbath garden with pomegranate tree

The far corners of the yard are also gardens. Flat tiles serve as eccentric stepping stones up into the temple garden. In it is a cutleaf maple, baby's tears, variegated mints, and ground covers in several colors. Purple wall flowers and variegated mint at the ends of the temple garden fit in well where pinks, purples, and clear greens are the rule. A little round, limestone frog house was made by a sculptress in the Canadian province of Prince Edward Island.

The garden in the opposite corner is a contrasting riot of yellows and oranges, with accents of purple, under a pomegranate with enormous, showy orange flowers and graceful gray branches. The focal point is a white birdbath, chosen to complement its counterpart, the frog house in the temple garden, and to soothe the wild jumble of color from orange wall flowers, 'Oriental Limelight' artemesia, native red California tiger lilies, yellow daisies, and the golden flowers of the shrub *Hibbertia aspera*. The brick stepping stones that lead in harmonize with the dominant oranges and yellows. Arielle, my two-and-a-half-year-old wonder-grandchild, loves to play in the birdbath with the bird ornament and has added two faux eggs — smooth, white river rocks.

Under the eaves, the garden is loaded with salvias of coral red and intense blues, a dwarf buddleia, strawberries for ground cover, and a border of small, iris-like clumps of *Ipheion uniflorum* 'Froyle Mill' with blue-purple flowers.

What you don't see in the photos are the two rose areas, with fine-textured, purple sedum bor-

Continued following page.

Small garden. *Continued from previous page.*

ders and ground covers. I am growing roses for the first time. They are devils, ready to take my blood. They contract every sort of ill and get almost all the care that the garden needs. I also didn't show "Orchid Way," which I created by planting everyone's bloomed-out orchids along a shaded path between the houses. I cut the flowers when, or if, they rebloom.

There are several reasons why this garden is such a peaceful place.

"Temple" garden

The precision of the Bend-a-Board boundaries between lawn and beds gives a sense of spaciousness well beyond the actual yardage; it provides serenity through control and definition. The grass is a fine texture; its smooth surface and color are perfect foils to the brightness and strong texture of the gardens.

The two corner gardens are unified by simple white elements, the frog house and bird bath. These rounded forms echo the circle of the central tree garden and the curving outline of the lawn. Unifying focal points and repeated forms are architecturally important, even necessary, where gardens which would otherwise clash in a riot of color. The path leading into each garden is made from a material reflecting the main color. Color accents evoke the other garden to unite the two. The color theme of each has emerged from something more subtle and more sparingly established in the central garden. In a painterly fashion, the repetition of textures, colors, and species binds them all together.

The yard is alive with butterflies, dragonflies, and tiny hummingbirds, sometimes all on the same spike of flowers. Blue jays, robins, and finches flit by constantly.

Though this California garden is not xeriscapic, it requires very little water.

Too bad you can't share a glass of wine in the evening with me while a cool breeze sways the vines and trees. What satisfaction this garden brings! ❁

Elizabeth F. Cole is the founder of HortResources (originally known as New England Horticultural Resources Network). Now living in California, she has been active in water conservation and ecology, a member of the Management Committee of the California Oak Mortality Task Force and Vice-Chairman of Trees and Views Committee of the City of Sausalito. Her autobiography can be found in *HRN* November-December 2003. Reach her at ecolemd@rcn.com.

Photographer Jason Nakano, of Gorgeous Studio, may be contacted at 838 Santa Clara Ave., Alameda, CA 94501, 510-333-5392, jason@gorgeous-studio.com, www.gorgeous-studio.com.

Ed Gurka is formerly head of gardens, parks, and arboriculture in Sausalito. Elizabeth says, "Ed is the most diversely expert horticulturist I have even known and he is also a trained artist. He appreciated my designs, gave me advice, and implemented the construction — more than making up for difficulties encountered in the process." Contact Ed at Egurka1@aol.com.

True gardeners cannot bear a glove
Between the sure touch and the tender root,
Must let their hands grow knotted as they move
With a rough sensitivity about
Under the earth, between the rock and shoot,
Never to bruise or wound the hidden fruit.

May Sarton, "An Observation," from A Private Mythology

Elizabeth's Plums

'Forbidden Fantasy'

In 1929, the American Horticultural Society combined the words "day" and "lily" to make one word.

GARDEN TOUR: DAYLILIES AT ELM BANK

Barbara Provest
Photographs by author

In 2000, the New England Daylily Society (NEDS) started the process of creating a garden to educate the general public about our passion, the daylily. NEDS members Richard and Joan Blagbrough, Nancy Britz, Joan Dahl, Suzanne Mahler and Dan Pessoni formed the steering committee. Other members made a trip to see garden spaces available at the headquarters of the Massachusetts Horticultural Society (MHS), 36 acres of the Elm Bank Reservation in Wellesley, Massachusetts. A perfect site in full sun was chosen; a thin bow-tie-shaped garden 137 feet long, located at the back of the Education Building, next to the Rhododendron Society's garden (a "must see" in the spring). In 2003, a contract was signed and planning began for the 1900-square-foot garden. Warren Leach of Tranquil Lake measured and drew up a map that included pathways through the garden so that each daylily could be seen up close and easily photographed, backed by shrubs that Warren had selected. After NEDS members dug out the good soil to add to the garden beds, Tranquil Lake installed the pathways.

With the addition of Denise Pavlovich and me, the committee members formulated a plan to show how far daylily breeding has come in the last hundred years. The display was to include samples of cultivars that would do well in a zone 5b garden, self-cleaning if possible: all forms, colors, heights, flower sizes, dips, tets, triploids, singles, doubles, spiders, unusual forms, and rebloomers. We wanted species first identified in East Asia before 1576 through to those registered in 2004. We wanted daylilies to be in bloom every day during the growing season, starting in mid-May and continuing to frost, with peak bloom in mid-July. We tried to color coordinate the plantings as much as possible and left room for drifts of annual and perennial color. We wanted all Region 4/New England hybridizers represented who had registered daylilies. We chose many plants from lists such as the Stout Medal Winners, Region 4 Award Winners, and our own NEDS Local

'Always Afternoon'

Continued following page.

Daylilies. *Continued from previous page.*

'All Fired Up'

Treasures. Daylily donations came in from zones 3 to 7 and all lived through the winter.

Companion plants were ordered from Green Mountain Transplants via the Internet. Five trees were removed. All the grass was scraped off, so we wouldn't be weeding out clumps for the next ten years. After a pH test, bags of lime and peat moss were added and a truckload of manure, compost, and worms were added to help make the soil friable. PVC pipes were laid under the stonedust paths in order to protect the irrigation hoses. Joe Biagioni from Arbor Alliance, in Douglas, Massachusetts, snaked the hoses through to the four sections of the garden and set the irrigation system to drip early Monday mornings, unless it rained.

NEDS members worked the last two weekends of May, amending the soil the first weekend and planting the donations the next. We had two rototillers working, thanks to Dorothy Campbell and Sue Russell, and dug up eight wheelbarrows of rocks. The daylily donations were collected from members and famous local gardens. Others were delivered to our May meeting.

All the signage was accomplished by computer in one day and laser printed at Staples onto clear mailing labels, Avery 5662, which were burnished onto See-Fine markers. We purchased a truckload of a very dark hemlock mulch to put under the plants, which took the rest of the summer to spread around, but made the garden sparkle. We fertilized with Espoma Flower-Tone, 3-5-7, an organic blend. We sprayed with Neem during the summer, which seemed to take care of unwanted pests (except Japanese beetles) and foliage diseases. The daylilies loved it in the full sun and many immediately set up scapes.

By the end of the summer we had a handicapped-accessible garden of daylilies and companion plants, such as phloxes 'Blue Boy', 'Eva Cullum,' 'Mt. Fugi', 'Becky Towe', and 'Natascha'; several echinaceas in new colors; agastache and platycodon; red and yellow asclepias; *Nepeta* 'Blue Wonder ' and *N.* 'Six Hills'; and *Aster* 'Warburg Star' and *A.* 'Woods Blue'.

Wedding guests, hummingbirds, dog walkers, joggers, people young and old from all over the world now enjoy our garden. Those who stop to read our markers find a lot information on each plant, such as daylily name, height, season of bloom, ploidy, size of flower, color, hybridizer's name and registration date with AHS (American Hemerocallis Society). They can learn the difference between a dip and a tet and enjoy a hybridizing lesson. The public gets a real kick out of our daylily names, like 'Zip Boom Bah', 'Jamaican Me Crazy', 'Eyes Have It', 'Gangster Of Love', and 'Toy Trumpets'.

'Pandora's Box'

As the clumps increase, fans are donated to our members sale in May or to the public sale on August 27. We will be evaluating cultivars and replacing those that aren't doing well. We want to be able to promote our Region 4 selling gardens and hybridizers and we have just become an official AHS Display Garden. At present we have almost 300 clumps of daylilies and we have listed them in an Excel spreadsheet with their pictures on our website www.nedaylily.org. We are working on a CD,

New England Daylily Society

DAYLILY SALE

AUGUST 27

$5 plants for sale 9-11 AM

$5-plus for sale 1-4 PM

Waltham Field Station

(UMass Extension Service)

240 Beaver Street

Waltham, MA

For more information:

Dan Matzek

603-437-4851

dmatzek.com

www.nedaylily.org

'Daylily Pink Suede Hues'

Continued p. 9.

SPREADING DOGBANE

Janice Stiefel
Photos by author

Botanical name. *Apocynum androsaemifolium*
Family. *Apocynaceae* (dogbane)
Name origin. The genus name *Apocynum* is derived from the Greek "*apo*" meaning "from" and "*kunos*," meaning "dog." The species name "*androsaemifolium"* means "having a specified number or kinds of stamens." The numerous common names reflect the wide range of medicinal uses.
Common names. Spreading dogbane, American ipecac, bitter dogbane, bitter-root, black Indian hemp, catch fly, colic root, common dog's-bane, fly trap, honey bloom, milk ipecac, milkweed, rheumatism wood, wandering milkweed, western wallflower, snake's milk, medicine lodge root, women's breast weed, *herbe a la puce* (flea herb)
Habitat. Dry thickets and borders of woods
Flowering. June to August
Height. 1- 4 inches

Spreading Dogbane is a lovely plant often found growing along roadsides. It is a relative of milkweed (*Asclepias* spp.) and a native perennial.

Dogbane has numerous small, bell-like, fragrant flowers, colored pink and striped inside with deeper pink. The broken stems and leaves exude a milky juice. The inch-wide flowers are clustered at the top or rising from the leaf axils. The leaves are 2 - 4 inches long, smooth, opposite, ovate, and blue-green. The fruit is a slender seed pod, 3 - 8 inches long, opening along one side, with seeds ending in a tuft of hair.

On July 11, 1749, early botanist, Peter Kalm recorded, near Fort St. Frederic in Canada:

> [t]he *Apocynum androsaemifolium* grows in abundance on hills covered with trees, and is in full flower about this time... The milky juice, when spread upon the hands and body, has no bad effect on some persons, whereas others cannot come near it without being blistered. I saw a soldier whose hands were blistered all over, merely by plucking the plant in order to show it to me; and it is said its exhalations affect some people, when they come within reach of them... I have often rubbed the plant in my hands till it was quite crushed without feeling the least inconvenience or change on my hand...

The outer layer of the stem provides a fine fiber that was considered by many Indian tribes as their best sewing thread. They also used it for cordage, weaving fishing lines, and bow strings. To make sure they would always have this thread, Algonquin women carried the seeds with them when they married.

The Menomini are said to have believed that the stalk drew deer to the hunt. The root was said to grow to great length and usually was found running north and south, says Charlotte Erichsen-Brown in *Medicinal and Other Uses of North American Plants*. The coagulated milky juice was used as chewing gum, according to *Wildflowers of Eastern North America* by John E. Klimas and James A. Cunningham.

Because of dogbane's powerful, digitalis-like action, it should be listed as a poison, although it was of great value to Indian medicine men, who used it with appropriate care. The large, milky rhizomes were dried and powdered.

In 1633, an herbalist wrote:

> Dogbane is a deadly and dangerous plant, especially to some foure footed beasts; for the leaves hereof being mixed with bread and given, killeth dogs, wolves, foxes, and leopards, the use of their legs and huckle-bones being presently taken from them, and death itself followeth…

Continued following page.

Dogbane. Continued from previous page.

Anyone who loves dogs or other "foure footed beasts" should recognize and be careful of this species, although cattle never touch the plant.

The metallic green and red dogbane leaf beetle (*Chrysochus auratus*) settles on the plant and remains inseparable from it. The beetles are beautiful insects and when on the foliage in great numbers, the plant appears to be studded with jewels.

Several resources list spreading dogbane as a host plant of the monarch butterfly. According to entomologists I have spoken with, this is not true. To further validate this, I checked with world-renowned monarch expert, Lincoln Brower, who said, "Monarchs cannot feed on dogbane. It is toxic to them and the first instar caterpillars cannot eat it. The old literature is incorrect."

I frequently traverse a road along which a healthy patch of spreading dogbane grew until it was mowed down by the highway crew. Its passing reminded me of Aldo Leopold's profound remark in *A Sand County Almanac*:

> I doubt whether a dozen people have seen the [plant] along the side of this highway, and of these dozen hardly one will notice its demise. If I were to tell a preacher of the adjoining church that the road crew has been burning history books in his cemetery, under the guise of mowing weeds, he would be amazed and uncomprehending… This is one little episode in the funeral of the native flora, which in turn is one episode in the funeral of the floras of the world.

References

- *Medicinal and Other Uses of North American Plants*, Charlotte Erichsen-Brown
- *Using Plants for Healing*, Nelson Coon
- *Wildflowers of Eastern North America,* John E. Klimas and James A. Cunningham

Janice Stiefel is the editor of the *Wisconsin Entomological Society Newsletter.* Contact her at: jstiefel@itol.com.

Daylilies. *Continued from p. 7.*

as visitors requested — you will be able to watch the slideshow, bigger than life, on your TV (talk about being addicted)!

When visiting Elm Bank Reservation, be sure to see the American Trial Gardens to the front of the Education Building, where the newest seeds are planted every year. View the restored Italianate Garden, the Herb Society's garden, Wheezee's Children's Garden, and the three goddesses that stood atop the Horticultural Society Building in Boston a hundred years ago. [The Goddess Garden around the Ceres, Pomona, and Flora statues was designed by **Christie Dustman**. Christie's advice on pruning will be profiled in the early fall issue of ***People, Places, and Plants***. —Laura Eisener] MHS also has a expansive horticultural library that its members can use — a good reason for signing up as a member. Bring a lunch, a friend, sun glasses, a hat, and wear comfortable shoes.

Don't forget your camera to take close-ups of your favorite daylilies. Believe me, you will find one you just can't live without — maybe Jan Joiner's spectacular 1997 'Pink Suede Hues', a reblooming, 6-inch, double, mauve-pink self with yellow-green throat.

Hope to see you there. It's worth the trip.

Girls,
do not scrub and cook and scour
until you have no time
to plant a tree or vine or flower.

—Jane Grey Cannon Swisshelm,
American author (1815-1884),
from "Letters to Country Girls," 1853

DIRECTIONS to Elm Bank, 900 Washington Street, Wellesley, MA: from Route 95/128, take Route 16 West towards Wellesley. Continue on Route 16, passing over Route 9 to Wellesley Center. Bear left and continue on Route 16 for 1.7 miles. Look for the green MHS sign on the left across from the Hunnewell Farm. Turn left on Cheney Drive, go over the bridge, turn right, and follow the big loop to the left, past the soccer fields and the three greenhouses to the parking lot by the caretaker's cottage.

Barbara Provest is the NEDS Garden Manager at Elm Bank Reservation. Reach her at bprovest@rcn.com.

BOOK REVIEW

Ulrike Preissel, Hans-Georg Preissel, *Brugmansia and Datura: Angel's Trumpets and Thorn Apples.* Firefly Books Ltd., 2002. 144 pages, ISBN: 1552095584, $20, paperback

Review by Claude Sweet
Photographs by author

Authors Ulrike and Hans-Georg Preissel of *Brugmansia and Datura: Angel's Trumpets and Thorn Apples* studied horticulture in Hanover, Germany. Since 1984, Dr. Hans-Georg Preissel has been the head of the 17th-century Herrenhäuser Gardens, the site of most of the excellent photographs. Both authors have been involved in breeding brugmansia and datura for many years and this book currently is the most definitive source of information. In an easy-to-read style, the Preissels discuss the history, culture, and landscape potential of the two genera. While both have large, trumpet-shaped flowers, *Brugmansia* (angel's trumpet) and *Datura* (thorn apple or jimson weed) are separate genera in the *Solanaceae*, or nightshade, family.

Datura stramonium

Datura seed pod

White brugmansia

Both brugmansia and datura are known for their narcotic and poisonous properties, derived from the alkaloids within the plants.

Native to South America, Brugmansia is a shrub, requiring a frost-free winter storage area when dormant or a heated area with bright light where it can grow and flower all winter. Brugmansia flowers hang down and the fruit is a long, slender pod.

Datura includes only annual herbaceous plants, most of which are low-growing or prostrate. It is native to the desert regions of the southwestern United States, Central, and South America. The flowers are easily distinguished from those of brugmansia as they point up. The fruit is spiny.

Both brugmansia and datura are known for their narcotic and poisonous properties, derived from the alkaloids within the plants. Ingesting or smoking any part can have serious, even fatal, consequences. Scopolamine is the alkaloid responsible for the hallucinogenic properties of datura, historically used in religious ceremonies by

Continued following page.

Brugmansia. *Continued from previous page.*

Native Americans to induce magical-seeming, visionary dreams. Symptoms are: dilated pupils; rapid heartbeat; and dry skin, mouth, and respiratory passages. Because scopolamine depresses the central nervous system, it is used as a sedative prior to anesthesia and as an antispasmodic in certain disorders characterized by restlessness and agitation, such as delirium tremens, psychosis, mania, and Parkinsonism.

Brugmansia. Brugmansia can be grown in containers or planted outdoors for the summer. Flowering occurs on new wood after the trunk branches have formed a broad crown. Plants respond well to being pruned severely in the fall in preparation for wintering indoors. The long, cigar-shaped flower buds will appear after flushes of new growth.

The book pays special attention to shaping brugmansias into a standard (tree form). Most people prefer to grow it as a single trunk that is allowed to branch 4-6 feet off the ground. The result is an umbrella shape that displays the flowers to best advantage. If left unpruned, it has a shrubby shape. The height depends on the climate. In cold weather areas, the plant will freeze to the ground but will sometimes regrow from the roots. In a mild winter area, brugmansia can reach 15 feet tall.

In California, in cooler coastal climates, like San Diego, it flowers all year; while inland, summer heat tends to limit flowering to spring and fall. Brugmansia will not flower until it has reached the stage when it starts to branch. Cuttings taken from flowering branches, however, will flower as small plants. For additional information, see http://faq.gardenweb.com/faq/brug.

The authors describe and illustrate seven species of brugmansia and many named hybrids. Hybrids have been developed in single and double flowering forms, in a wide range of solids and bicolors: pure white and shades of yellow, pink, orange, and red. Flower form and size, fruiting structures, and leaf size and shape are discussed as a means to identifying the genetic background of named selections. Also discussed are pollinating, harvesting, storing, and planting of seed. A useful chart indicates crosses that have produced viable seeds.

Hybrids must be vegetatively propagated from hardwood or semi-hardwood stem cuttings. Cuttings can be rooted in water or directly into pots of well-drained potting mix. Bottom heat is helpful in encouraging rooting; rooting hormone is not usually necessary.

Interested in hybridizing brugmansia? Seed is the easiest option by which non-commercial growers can exchange genetic material between different countries. Brugmansia needs to be outcrossed to obtain viable seed; however, the outcrossing precludes developing a stable seed strain. A seedling takes two or more years to flower.

Peach brugmansia

Brugmansia plants are available through eBay, mail order nurseries, or local garden centers.

Brugmansia is an excellent specimen plant or used in the garden beds with lower-growing plants at the base.

Datura. Datura is not yet found in in retail outlets in a ponypak. However, it is increasingly offered in seed catalogues in solids and bi-colors, in white, yellow, and lavender to dark purple. It is also available in single- and double-flowering forms.

Datura is very easy to grow from seed and flowers the same season if the seeds are started eight weeks before the last frost.

Datura is more drought-resistant than brugmansia and can be used to cover larger areas, such as banks. Both datura and brugmansia make excellent patio plants when grown in containers.

Warning: the comments on Yahoo forums indicate that growing these plants is addictive. I suggest you share in the wealth of information and avail yourself of the cuttings that are generously offered. Register at http://groups.yahoo.com/group/brugmansia for both brugmansia and datura discussion. Another source of info is http://www.brugmansias.org.

Claude Sweet is a retired horticulturist who has written books and taught courses in specialty fruit production and marketing. He can be contacted at hortventures@cox.net.

SCIENCE WORKS!

LIMITATIONS OF COMMERCIALLY CULTURED MYCORRHIZAE IN THE LANDSCAPE

Norm Helie

It has become popular to promote the use of mycorrhizae as an aid to growing healthy trees. However, before you hop onto the mycorrhizal train, be sure to get the facts so you can get on the right track. Be aware of the limitations of introducing mycorrhizae into the landscape. In fact, mycorrhizal inoculations in anything except sterile soil have been shown to be unwarranted.

"Mycorrhizae" is a term meaning "fungal root." Mycorrhizae are water- and nutrient-absorbing organs composed of both root and fungal cells. A mature tree may have as many as fifteen mycorrhizal species colonizing its roots in a given year and over a hundred species of mycorrhizal fungi in its lifetime (Cairney, 1999; Durall, et al., 1999). Many of these symbiotic relationships are exceptionally dynamic, changing daily. Sinclair, et al. (1987) describes the mycorrhizal relationship as "balanced reciprocal parasitism" in which the fungal partner, which is unable to fix carbon, obtains carbohydrates, vitamins, and other organic compounds from the photosynthetic plant. The plant receives from the fungus various mineral nutrients, especially phosphorous, that would be less available to it from the soil via its own absorptive capability. In harsh environments, mycorrhizae also enhance the plant's tolerance and resistance to certain pathogens.

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If plant tissue and soil are deficient in phosphorus and the soil is sterile or close to sterile, then mycorrhizal treatments can be beneficial.

Mycorrhizae are influenced by: pH; light intensity, quality, and duration; minerals in the soil and plant; and, competing indigenous mycorrhizae and soil microbes. Mycorrhizal deficiency is unlikely except in soils that have recently been fumigated, where trees have never grown, or where topsoil has been removed (Sinclair et al., 1987).

Phosphorus is essential to the life functions of cells — division, expansion, respiration, and photosynthesis. One measure of the need for mycorrhizae is the phosphorous level in the plant tissue and the soil. Competition with indigenous fungi, according to Marchner (1986), is the greatest limiting factor in successfully introducing a cultured fungus; this competition is magnified in phosphorous-deficient soils because the numbers of native fungi are already high. If the level of phosphorous is normal or higher in plant tissue and soil, as it is in much of our nursery-grown stock, the tree will not tolerate a mycorrhizal relationship and the inoculation will fail. And where native mycorrhizae are already in great numbers, enormous amounts of inoculum would be needed in order to overcome the competition (Sanders and Sheikh, 1983). Furthermore, Marx, et al., (1982) show that high soil fertility inhibits mycorrhizal development regardless of the inoculum source or rate. In fact, mycorrhizal inoculations at high-fertility levels were one half as successful as those at low-fertility levels. In many horticultural circumstances, fertilizer rather than mycorrhizae would achieve more nutritional benefits.

However, if plant tissue and soil are deficient in phosphorus and the soil is sterile or close to sterile, then mycorrhizal treatments can be beneficial. Otherwise, introduced mycorrhizae will be a food source for native mycorrhizae and organisms, such as soil microbes. No significant contribution to tree growth has been shown by adding commercially generated spores to soil which is not sterile.

Marx, et al., (1982) recommends a single application of Captan, a fungicide, as a drench prior to planting in nursery soil to eliminate: the natural competition of soil microorganisms that colonize introduced inocula (Bowen and Theodorou, 1979; Marx, 1980); feeder root pathogens that damage roots (Ruehle 1973, Marx, et al., 1976); and, indigenous competing ectomycorrhizal fungi from previous tree crops (Marx, et al., 1976, 1978). As fungicidal treatment is needed in non-sterile soil for introduced mycorrhizae to succeed, the conclusion must be that mycorrhizal inoculations are generally unwarranted in non-sterile soil.

A positive correlation exists between the efficiency of mycorrhizae and light intensity, duration, and quality. The host tree supplies carbohydrates for the mycorrhizae but the carbohydrate levels of shaded trees are not high

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enough to support a relationship with mycorrhizae. It would be extremely rare for a forested shady area to have sterile soil. However, if the soil is sterile and deficient in phosphorous, such as in an area behind or next to a building, it would be beneficial to use mycorrhizal organisms.

Soil pH also affects the success of mycorrhizal inoculations (Hung and Trappe, 1983). Extremely acid (pH less than 4.5) to medium acid (pH 5.6 to 6.0) is the range preferred by many cultured mycorrhizae. In even more acidic soils, lime should be added. Bakker (1998) reports that liming increased mycorrhizae development in English oak (*Quercus robur*) root tips. It is always wisest to enhance the soil conditions to suit the biological communities. One of the best ways to do this outside of a forested area is to apply wood chips to the soil (Schoenholtz, et al., 1992).

In many horticultural circumstances, fertilizer rather than mycorrhizae would achieve more nutritional benefits.

The use of mycorrhizal inoculations is limited by indigenous mycorrhizae and micro-organisms and the level of phosphorous, light and pH. Soil scientists and soil microbiologists have not scratched the surface of knowledge of mycorrhizae. This ignorance alone should stop us, as horticulturists, in our tracks. Research mycorrhizae for yourself. Be an engine, not a caboose. Get on the right track and know the facts before using commercially cultured mycorrhizae.

Science works!

Mycorrhizae and Additives

Agricultural Research Service (ARS) plant pathologist Robert Linderman at the Horticultural Crops Research Laboratory in Corvallis, Oregon, is studying how mycorrhizae interact with fertilizers and other soil amendments that have been commonly used in agriculture over the past half century. Measuring the level of mycorrhizal colonization of roots to see whether various materials added to soil help or inhibit fungal growth determined that organic fertilizers are usually compatible. Coir, a coconut fiber that has become a popular potting mix additive, does not inhibit mycorrhizae, but it may reduce growth of some plants. Linderman is currently studying various types of composts to see if they have any effect on mycorrhizae; initially, it seems that some composts may suppress the fungi because of high phosphorus levels. —Agricultural Research Service, USDA, May 2004 magazine, online at http://www.ars.usda.gov/is/AR/archive/may04/fungi0504.htm.

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TIDBITS

Pesticides. The Ontario College of Family Physicians (OCFP), an association representing over 6,700 family physicians in Ontario, released a comprehensive review of research on the effects of pesticides on human health. The review shows consistent links to serious illnesses such as cancer, reproductive problems and neurological disease. The study also shows that children are particularly vulnerable to pesticides.

Principle findings. The many studies reviewed show associations between tumors and pesticide exposure, including cancers of the brain, prostate, kidney, and pancreas. The review indicates that 2,4-D and related pesticides are possible precipitants of non-Hodgkin's lymphoma (NHL), confirms an association between pesticides and leukemia, and uncovers a remarkable consistency of nervous system effects. The review also indicates that occupational exposure to agricultural chemicals may be associated with reproductive problems, including birth defects, fetal death, and intrauterine growth retardation.

Pesticide effects on children. There have been few studies on the long-term effects of low levels of pesticides on children. However, the review finds an association between paternal pesticide exposure through agriculture and elevated risk of kidney cancer, brain cancer, and hematologic tumors, including non-Hodgkin's lymphoma and leukemia. Children appear to have overall increased risk of acute leukemia if exposed to pesticides in utero or during childhood on lawns, fruit trees, gardens, and indoors.

What the public should do. Given the wide range of commonly used home and garden products associated with health effects, OCFP's message is to avoid exposure to all pesticides. This includes occupational exposure and lower level exposure in homes, gardens, and public green space.

What Family Physicians Should Do. OCFP advises that family physicians screen patients for pesticide exposure when non-specific symptoms are presented, such as fatigue, dizziness, low energy, rashes, weaknesses, sleep problems, anxiety, and depression. It advises that physicians participate in educating patients.

The OCFP Study is at www.ocfp.on.ca or contact: Josh Cobden, Jennifer Casey or Jan Kasperski, Environics Communications Ontario College of Family Physicians, 416-920-9000, 416-867-9646, and jcobden@environicspr.comjk_ocfp@cfpc.ca.

Testing pesticides. The U.S. House voted to bar the Environmental Protection Agency from conducting or accepting studies that test pesticides on humans. Last month, the administration, under pressure from congressional Democrats, canceled an EPA study that would have paid 60 Florida families about $1,000 each to monitor their babies' and young children's exposure to pesticides over two years.

Former President Clinton banned the practice of using data from tests on people to set nationwide limits for pesticide exposure, a ban overturned by George W. Bush. The administration now accepts results of human studies on a case-by-case basis. Richard Wiles, senior vice president of the Environmental Working Group, said, "The federal government must not in any way support the highly unethical practice of dosing people with pesticides. These tests are even more repugnant when one considers that their sole purpose is to weaken public health protections." —Juliet Eilperin, *The Washington Post,* May 21, 2005

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MEMBER NEWS

Members: submit items about yourself and other members!

NEW MEMBERS

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Old Sturbridge Village feted **Paul Rogers** with a reception and dinner on June 10 to thank him for all that he has done for the Village. The extensive herb garden was named in his honor and a sign was erected that shows Paul in 1830's clothing. Rather than resting on his laurels, Paul showed up in the sweltering heat on June 11 and 12 at Old Sturbridge's Garden Weekend, to answer questions about historic garden practices, modern garden pests, and how to set stepping stones. For more information about the Paul Rogers Garden or to participate in horticultural activities, call Old Sturbridge Village at 1-800-SEE-1830. —Laura Eisener

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Tidbits. *Continued from previous page.*

Greenhouse sanitation. Michigan State University's Greenhouse Sanitation video/DVD can be used to train employees on proper sanitation procedures for handling greenhouse plants. The 12-minute program is available in Spanish and English. Contact Jeanne Himmelein at 269-384-8010 or himmele1@msu.edu to order. —GMPRO greEn-MAIL, for Feb. 22, 2005

Scotts in antitrust case. AgrEvo Environmental Health Inc. brought suit against Monsanto for attempting to monopolize the nonselective herbicide market. The suit alleged that Monsanto and Scotts conspired to eliminate an herbicide that Scotts had acquired from AgrEvo in1998, after which Scott agreed to become Monsanto's exclusive marketing agent for Roundup. A U.S. district court ruled in favor of Scotts Co. Monsanto settled with AgrEvo earlier this year.

Online directory from *Garden Design.* *Garden Design* magazine launched an online directory of green goods, retailers, and service providers that can used to search locally for products and services mentioned in the print version of the magazine. —The Weekly Dirt, for 21 June, 2005

NewFarm.org includes an organic farm locator, articles on sustainable farming, and news about GMOs. —Sally Williams

Strange Days on Planet Earth, www.pbs.org/strangedays, is a companion site to the four-part series on PBS, produced by National Geographic. Four themes of global change are examined, including invaders, temperature change, predators, and water quality. The source of the troubles always seems to trace back to human action. In the show on predators, one example involves the relationship between the decline of jaguar populations and the demise of Venezuelan rain forests. The site includes a teacher's guide.—BOTLINX@lists.ou.edu, May 24, 2005 ❁

Member news. *Continued from previous page.*

Phytophthera ramorum is a frightening issue and it is spreading through the U.S. in shipments of nursery material. HortResources is making the 7-page, in-depth article by **Elizabeth Cole** from the *HortResources* March-April 2005 issue available to everyone involved in landscaping. Please pass your newsletter on to others or have interested parties contact Fran Gustman, editor, *HortResources Newsletter*, fgustman@gmail.com. ❁

Garden Literature Index™

Garden Literature Index is an on-line bibliographic database that has been a long time coming — 14 years. It is now available via EBSCOhost® at more than triple the size it was when **Sally Williams**, founder and editor, was compiling it on her own. The database contains periodicals and some books on horticultural and botanical topics; one focus is environmentally sustainable practices. More than 300 core titles are indexed and abstracted, including titles not available in any other index. Periodicals range from national general gardening titles to high-end scholarly works, the majority in English, some indexed back further than a decade. A full-text product is planned in the near future.

EBSCO Publishing makes free trials available to libraries, institutions, corporations, and government agencies.

Contact Sally Williams at swilliams@epnet.com.

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