



~Gardening with Bulbs ~

The Bulb Garden

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Denver Botanic Gardens: Diversity in the Rocky Mountain Region

Sarada Krishnan

Sarada Krishnan has been with Denver Botanic Gardens as Director of Horticulture since June 2006 and is responsible for directing the design and maintenance of the horticulture gardens and collections. She has a Bachelor of Science degree in Horticulture from India, where the focus was on tropical horticulture, and a Master of Science degree in Horticulture from Colorado State University, with a research focus on the propagation of native Colorado flora specializing in plant tissue culture.

Sarada is currently a doctoral candidate

at University of Colorado, Boulder, and will be defending her dissertation in May 2011. Her doctoral research is on conservation genetics of the wild coffee (Coffea spp.) in Madagascar. She recently purchased a coffee plantation in Jamaica and is owner of Diversity Company Limited, producing Jamaican Blue Mountain Coffee. Among her many ac-

tivities, she is a faculty affiliate with Colorado State University's Department of Horticulture and Landscape Architecture and serves on the board of directors of Plant Select® and Butterfly Pavilion.—Ed.

A mile above sea level at 5,280 feet, Denver Botanic Gardens is situated in a semi-arid climate with hot, dry summers and cold winters and an annual precipitation of 12 to 16 inches. With as chal-



Tulips grow in the perennial walk. Photo by Sarada Krishnan.

lenging a climate as ours, at DBG we have found a niche through the artistic display of regional Western landscapes with many

individual gardens reflecting a sense of place. In addition, several gardens showcase plants from regions with climates similar to ours as well as more traditional European and Asian designs. Within an area of 23 acres in the heart of the city, we practice intense horticulture. Almost 31,000 plants—belonging
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Board of Directors

Jim Waddick, President
jwaddick@kc.rr.com

Paul Machado, Vice President
Farmerguys08@gmail.com

Pamela Slate, Secretary
pslate22@yahoo.com

Arnold Trachtenberg, Treasurer
arnold140@verizon.net

Jane McGary, Membership
janemcgary@earthlink.net

Dell Sherk, BX Director
ds429@comcast.net

Volunteers

PBS list: Mary Sue Ittner, Arnold Trachtenberg, Diane Whitehead

PBS wiki: Mary Sue Ittner, Nhu Nguyen, David Pilling, Mike Mace

The Bulb Garden: Jane Merryman, editor; Jennifer Hildebrand, co-editor

The PBS Directory: Jane McGary, editor

Publications Distribution: Arnold Trachtenberg

Passing the Torch

Robert Werra

Robert Werra gardens on a steep hillside overlooking Ukiah, California, USDA zone 9, where he has warm, dry summers and cool, rainy winters with occasional freezing. He specializes in South African bulbs and is especially fond of *moraeas*. — Ed.

We all carry a torch of passion for nature's bulbous plants. Passing this torch on to the next generation already engaged by texting and Facebook is a difficult task. However, the task is much simpler with young children. We can gain their interest before the Gameboys and cellphones do.

In recent years a number of elementary schools have begun garden projects with the help of staff and volunteers. They would be happy to have our expertise

showing kindergartners how to pollinate plants, how to harvest and plant seed, and how to tend the seedlings through several years until blooming when they can proudly present the glorious results to their parents. Hopefully, these children will learn basic horticultural skills as well as the virtues of patience and delayed gratification that go with growing bulbs. Most of all, we can inculcate the appreciation and love of bulbous plants and ultimately ensure the future membership of PBS.

I am currently doing this at St. Mary's Elementary School in Ukiah, California, beginning with 25 kindergartners. In our California mediterranean climate, I chose *Moraea pedula* for this project. This tall, vigorous *moraea* has a long blooming period and blossoms loved by bumblebees, and it is a profuse seed setter.

In March I take blooming plants to the classroom. I illustrate how the bumblebee transports pollen from the anthers of one plant blossom to the stigmas of neighboring plants and explain how that leads to the

formation of seed sacks for new plants.

Each student then takes a turn with a fine brush to play bumblebee and carefully transfer pollen between plants. The girls tend to do this with great care and precision. The boys just moosh pollen from one blossom to the other. It all seems to work.

In June I return the dormant plants to the classroom with some remaining seed pods and some collected seed. We open and harvest some seed pods and gently inspect the hibernating mother corm. Then the students carefully print name labels for their individual pots and spread the seed. They say goodnight to the seeds and cover them up to sleep until the rains wake them in the fall.

During summer vacation I store the pots in shade

at home. After the fall rains have sprouted them well, the plants are returned to the students who are now first graders. They admire and care for them through the school year with the encouragement of the



garden volunteers. During the summer I store them at home again and we repeat the cycle until full blooming in third grade. Then the students proudly present their hard-earned big prize to their parents.

The biggest prize is mine, however—the opportunity to pass the torch of our passion for bulbous plants on to the new generation. And, besides, it's just plain fun interacting with these little children.

I believe each of us can reproduce this project in

This page: Bob Werra and a kindergarten student at St. Mary's School pollinate *Moraea pedula*. Facing page, clockwise from top left: students' *Moraea* pots send up thin shoots; a close up of *Moraea pedula*; St. Mary's first graders with their pots and Gardening Volunteer Missy Nelson

Passing the Torch



Denver Botanic Gardens: Diversity in the Rocky Mountain Region (cont'd)

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to 8,300 species, 2,000 genera, and 261 families—find a home within our walls in 40 themed gardens.

Incorporated within all these gardens are spring bulbs that without fail provide splashes of color starting as early as February and continuing to as late as June. Summer and fall bulbs are also well represented. Our plant collections include 1,040 taxa of

Crocus, *Eremurus*, *Fritillaria*, *Galanthus*, *Gladiolus*, *Hemerocallis*, *Iris*, *Lilium*, *Narcissus*, and *Tulipa*.

In addition to the main site in the city of Denver, DBG operates satellite sites at Chatfield, which is a 750-acre wildlife and native plant refuge in Littleton, and a high-altitude trail and interpretive garden at Mount Goliath located at an elevation of about 12,000 feet. The Chatfield site also features the agricultural



Eremurus himalaicus thrives at the DBG. Photo by Sarada Krishnan.

geophytes, including bulbs. These collections represent a few wild-collected taxa as well. Notable among the wild-collected species are *Brunsvigia*, *Cyrtanthus*, and *Haemanthus*, grown from seeds collected on a trip to South Africa in 2006. Currently in germination trials are *Eremurus* and *Tulipa* seeds wild-collected from an expedition to Kazakhstan in 2010. The non-hardy plants in our bulb collections are grown indoors during the winter and exhibited outdoors in containers in the summer. Predominant genera of geophytes represented in our collections include *Allium*, *Corydalis*,

heritage of our early settlers and displays include a corn maze, a pumpkin patch, and a community-supported agriculture program.

Since we are a museum of living collections, accredited by the American Association of Museums (AAM), we place great emphasis on proper stewardship of our plant collections. We have seven major living collections: Alpine, Amenity, Aquatic, Cactus and Succulent, Native, Steppe, and Tropical. Our significant Oak (*Quercus*) collection is part of the

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Denver Botanic Gardens: Diversity in the Rocky Mountain Region (cont'd)

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national collection registered under the North American Plant Collections Consortium (NAPCC). We are currently working toward registering our alpine collection as part of the national collection with NAPCC.

Plants belonging to this collection are distributed in various garden locations including the Rock Alpine garden, troughs in Wildflower Treasures, Bristlecone, and Mount Goliath.

nia, *Rosa*, *Syringa*, and *Viburnum*, among others.

Aquatic

The aquatic collection consists of hardy waterlilies, tropical waterlilies, lotuses, *Victoria wa-*



Eranthis himalis seems equally happy at the DBG. Photo by Sarada Krishnan.

These seven major living collections support our mission and programs in horticulture, conservation, education, and research:

Alpine

The alpine collection at DBG includes plants from high elevations that need well-drained soils. Plants that grow in rock crevices also do well in our alpine gardens.

Amenity

The amenity collection has a theme of Rocky Mountain and Plains horticulture with the purpose of showcasing horticultural practices in our semi-arid climate. Plants belonging to this collection are located throughout the gardens and include horticulturally significant plants belonging to *Hemerocallis*, *Iris*, *Paeo-*

terlilies, tropical marginals, hardy marginals, floating plants, and carnivorous plants.

Cactus and Succulents

Consisting of hardy and non-hardy cacti and succulents, this collection of more than 3,000 plants located in the gardens as well as the Cactus and Succulent
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Denver Botanic Gardens: Diversity in the Rocky Mountain Region (cont'd)

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House, represents a good cross-section from many parts of the world.

Native

The native plant collection showcases plants native to both Colorado and other regions of the West, providing educational opportunities around

to other steppe regions and this collection showcases steppe plants predominantly from Asia and includes some from Africa, South America, and North America.

Tropical

This collection, located in the Boettcher Memorial Conservatory, showcases plant species



Juniperus squamata 'Blue Star' offsets the brilliant orange of *Tulipa* 'Daydream' at the DBG. Photo by Sarada Krishnan.

issues of conservation and sustainability. This collection, distributed throughout the gardens, contributes to a regional sense of place and helps connect visitors to the natural landscapes of the High Plains and Rocky Mountain region.

Steppe

The steppe biome is a dry, cold grassland that is found in all of the continents except Australia and Antarctica. Denver has climate similar

found in the lowland tropical rainforests around the world, including cultivated varieties chosen for their exceptional form or color.

As stewards of the living collections, the Horticulture staff at Denver Botanic Gardens is always looking at enhancing our plant collections and horticultural displays. Horticultural excellence is reached by selecting plants that will perform well in Colorado's arid

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climate. This means not only using some tried and true plants but also new cultivars and less well known plants to research their suitability to our climate. Our collections are enhanced through local and regional seed collecting trips and through participation in the international seed exchange program for botanic gardens, Index Seminum. Depending on funding, international collecting trips are also

bulbs were planted in our streetscape and the new Children's Garden.

As part of the Master Development Plan, a new Greenhouse Complex funded by the citizens of Denver through the Better Denver Bond Campaign opened last fall. This much needed complex will serve Denver Botanic Gardens' programmatic vision by enhancing existing programs and creating opportunities for the develop-



Two healthy clumps of *Galanthus elwesii* at the DBG. Photo by Sarada Krishnan.

undertaken. Seeds collected are tested for germination and planted in our trial garden plots at the Chatfield site to test for their adaptability to our challenging climate.

In late 2007, the DBG Board of Trustees adopted a Master Development Plan, leading to a four-phase capital campaign. Well into Phase Two of our capital campaign, the Gardens have seen significant changes over the past two years. With the establishment of new gardens and programs, new opportunities to enhance our plant collections have been created. Just this past fall, more than 30,000

ment of new programs. The 50,000-square-foot complex consists of 16,000 square feet of new state-of-the-art greenhouses with flexibility for 12 climate control options, a renovated Marnie's Pavilion—a display space predominantly for our epiphytic collections (orchids, bromeliads, and ferns), an Orangery with seasonal year-round displays reminiscent of traditional European Renaissance garden displays, a public classroom, and horticulture department offices. The establishment of a new

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From My Point of View

Marguerite English

Marguerite's garden is in Descanso, California (east of San Diego). During her busy days she seeks out her garden for a little solace. — Ed.

Snow in my area is short-lived, but interesting. We don't get many snowstorms, but this year I had about a foot and a half in my garden for three days. Those of you who really must deal with snow probably laugh that I even mention it, but it does tell you that I don't live in a typical California garden. My dog discovered snow for the first time this year. She ran and played, tossing it into the air with her nose and kicking it around for about 20 minutes, then came in to snooze and never noticed it again. So much for the snow!

Everything was late blooming this year. Even the daffodils I usually see in January didn't arrive until after that snow flurry. But the garden is awakening, and there is something new showing most every day. I found a nice

wallflower variety that has been blooming heartily for over a month now. There is a cluster of sparaxis flowers and some hyacinths and daffodils.

My little magnolia tree is blooming too. It didn't bloom last year because I had transplanted it from a container into the ground and it was sulking. It's going to be a beauty when it gets a bit taller. I'm getting some early nibbles from the asparagus patch and even have one yellow rose in full bloom. Those are planted together—I like having the asparagus turning into ferns behind the rose bushes as the season progresses.

As I meander through the greenhouse on my morning tour, there is the gorgeous blue of *Ipheion* 'Rolf Fielder'. I do love that blue! It reminds me of the sky after rain clouds have cleared away. There is a light tangerine-colored bud on *Cyrtanthus brachyscyphus*, but it hasn't opened completely



yet. Just inside the door, visitors are greeted by a container of colorful primroses.

All of my oxalis varieties were denuded by a marauding family of field mice. I suspect they got some other early-blooming flower spikes as well. Luckily, Sheba the cat got busy last week; she's been leaving corpses at my door. I suspect there is still one evading her and I have been temporarily covering the bulb containers with wire cages.



Clockwise from bottom left: *Narcissus*, *Sparaxis*, and *Ipheion* 'Rolf Fielder' flourish in Marguerite's garden. Photos by Carole Dearman.

Board of Directors Meeting, January 2011

President Jane McGary called the meeting to order on January 16, 2011, at 12:05 p.m. (Eastern). All officers and directors were present. The minutes of the previous meeting had already been approved by electronic vote. Treasurer Arnold Trachtenberg reported a flurry of new and renewing members and BX payments. He estimated that 75 percent of incoming funds arrive via PayPal. BX payments are nearly all current and members have responded well to payment reminders. Arnold plans to send out renewal reminders in early February.

Dell Sherk reported that the BX is quite slow (normal for this time of year). He is preparing both a seed order to generate BX business and the year-end seed sale list. This list will be sent out with the next issue of *The Bulb Garden*. Dell asked board members to suggest suppliers of hardy bulb seed. Paul Machado volunteered a donation of lily seed in conjunction with Mike Homick.

Patricia Colville reported that the membership system is working well and activity is currently high. PBS had 252 members as of December 31, 2010. Pamela Slate noted there were 232 members in October of 2010. Patricia noted there is an annual dropout rate of 20 to 30, but usually new member numbers equal or exceed that rate. Jane McGary noted the importance of the "contacts" section of the website which allows people to ask questions; providing helpful answers to those questions convinced several new members of the benefits of PBS. An updated member list will be available at the end of January.

Under New Business, the board discussed Mary Sue Ittner's observation that about 20 members are not on the PBS list and therefore do not know of and benefit from the BX. Dell and Jane decided to coordinate a separate email list to ensure that these members can take advantage of the BX.

Also under New Business, Jane remains interested in how PBS members can get acquainted and possibly conduct regional meetings or activities. She looked at member addresses and saw that the largest clusters are in the San Francisco Bay Area and the southern California area, while other clusters are in Florida and in the Washington, D.C., New York, and Washington/Oregon areas. Patricia Colville said that members do cross over at meetings of other clubs and societies, but no one seemed to think PBSers made extra efforts to meet one another at such meetings except at the NARGS study weekend. Dell noted that the Gesneriad Society has its annual conference in Philadelphia this summer and members of both organizations could meet there. Jane volunteered to write a note for *The Bulb Garden* to address this topic and discuss ways for PBS members to meet one another in these situations.

The next board meeting was tentatively set for April 17, 2011, at the usual time.

On February 17, 2011, the following electronic motion as proposed and passed: BX participation by non-renewed members is allowed until February 1 of each calendar year.

Treasurer's Report, Year End 2010

BALANCE 1/1/2010	22,223.44
U.S. Members	\$2,040.00
Overseas Members	\$900.00
Contributions	\$101.00
BX Receipts	\$4,689.20
Investment results	\$11.52
TOTAL INCOME	\$7,741.72
BX/SX Expense	(\$2,263.15)
Board Conference call	(\$200.36)
Supplies	(\$299.14)
Total Publications	(\$3,990.00)
PayPal expense	(\$349.72)
Postage	(\$1,378.92)
Secretary Expense	(\$20.32)
TOTAL EXPENSES	(\$8,501.61)
Correction	(\$759.89)
BALANCE 12/31/2010	\$21,463.55

New Officers & Board Positions in PBS

The following changes in PBS leadership took place as of March 21, 2011:

(1) Patricia Colville has resigned from the position of Membership Coordinator after serving in that capacity throughout most of the Society's existence. Our gratitude goes to Patty for her long service.

(2) Jane McGary has resigned the position of President and will become Membership Coordinator. All correspondence regarding membership and associated records, as well as dues payments sent by check through the post, should now go to the following address. (Members using PayPal to pay their dues should continue to do so through the website; the PayPal account is managed by Treasurer Arnold Trachtenberg.)

Jane McGary, Membership, Pacific Bulb Society
4620 SE View Acres Rd.
Milwaukie, OR 97267-3015, USA
janemcgary@earthlink.net

(3) James Waddick of Kansas City, Missouri, has agreed to serve as President for the remainder of 2011. A new slate of officers will be nominated for election by the membership in January 2012.

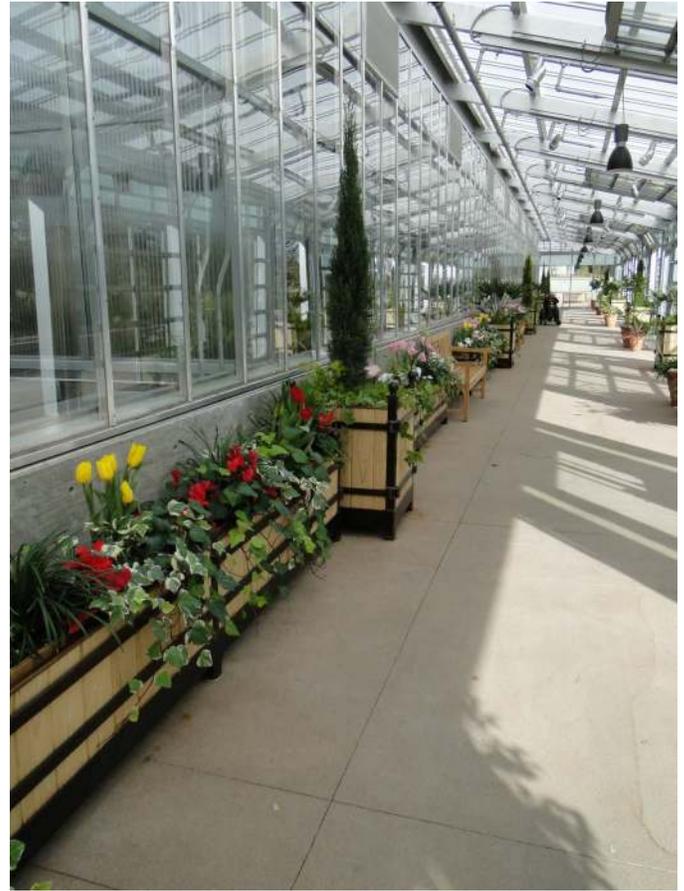
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tissue culture lab and micropropagation program as part of the Greenhouse Complex will soon enhance our plant propagation research. The lab will become operational in April 2011.

The Orangery offers an aesthetic transitional space between the greenhouses and the outdoor gardens. Displaying citrus trees and other seasonal colorful plants, this space consists of roll-up doors that will remain open during seasonable weather, spilling the plant displays outside into the adjacent terrace. The seasonal displays in the Orangery are changed every two to three months. The year started with an amazing orchid display; in early March, it was changed out to display forced bulbs. As part of the new greenhouse complex, we built a walk-in cooler which we are testing bulb forcing. The majority of the bulbs in this year's display were purchased from local growers, supplemented with bulbs grown in-house. With the practice we gain from forcing bulbs this year, we plan on growing a majority of the bulbs ourselves for next year's display. This will give us the opportunity to display unusual bulbs that are typically not forced by commercial growers.

The diversity represented within our gardens is tremendous and I hope that if your travels bring you to the Rocky Mountain region, you will stop by Denver Botanic Gardens and enjoy the beauty of our garden designs where our plant collections are artistically incorporated into the landscape.



The seasonal Orangery display at the Denver Botanic Garden.
Photos by Sarada Krishnan.



Book Review: *Grow Bulbs*

Grow Bulbs: A guide to the cultivation and propagation of the bulbs of South Africa and neighbouring countries, 2nd edition. By Graham Duncan. Kirstenbosch Gardening Series. Cape Town: South African National Biodiversity Institute [e-mail bookshop@sanbi.org.za], 2010. ISBN 978-1-919684-56-7. Paperbound, 390 pp., color photos throughout.

Reviewed by Jane McGary, Portland, Oregon, USA

Jane McGary has been president of the PBS and editor of the NARGS Rock Garden Quarterly. In fall 2010 she moved to a new home and garden in a suburb of Portland, Oregon, where her extensive collection of hardy bulbs is now housed in raised beds in a 20-by-40-foot open-sided greenhouse.

Gardeners in California and the warmer parts of the United Kingdom and France grow many species from the vast bulbous flora of southern Africa, especially from the Eastern and Western Cape regions of South Africa, which variously offer both winter- and summer-rainfall climatic regimes. A few genera and species have diffused beyond these “banana belts” into the greater horticultural world, but this new edition of Graham Duncan’s useful book should entice gardeners in cool temperate regions to experiment further.

Following an introduction to climate and habitats, Duncan describes the thirteen families to which the bulbs covered in the book belong. Here and in the rest of the book, the author assumes some familiarity with terminology and comfort with botanical names, but the prose is very easy to read. A chapter on cultivation briefly hits the high points and is expanded on by a section on pests and diseases at the end of the volume. Duncan clearly is addressing our kind of grower in subsections on “Maintaining a bulb collection” and “Hand pollination.” There is a good discussion of growing bulbs in containers, too.

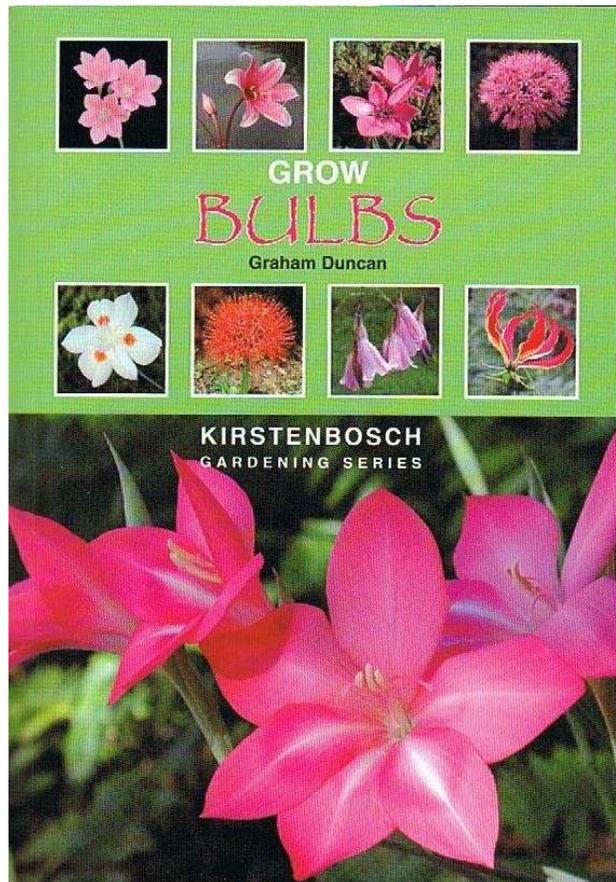
Of high interest to growers outside mild regions is Duncan’s discussion of “Temperature and hardiness,” and the provision of hardiness ratings for every species

included. He uses four categories: frost tender (plants can withstand temperatures down to 5°C/41°F), half hardy (down to 0°/32°), frost hardy (down to –5°/23°), and fully hardy (–15°/5°). In my former garden his frost hardy plants would have survived in the bulb frames, and the fully hardy ones in the open garden; in the new garden I’d be tempted to try the former in the open once I construct some better-drained planting beds. Looking through the species and their ratings, I find that they generally agree with my experience growing them in a winter-wet, summer-dry temperate region in a well-drained soil. In fact, some of his half hardy species (e.g., *Gladiolus tristis*) did well for me as frost hardy plants—but were not fully hardy.

The bulk of the volume is divided into descriptions of genera and selected species within each, divided into winter-growing, summer-growing, and evergreen sections. Notes on the genus include significant cultural information. The species appear to be selected for ornamental value, but I don’t know how available all of them are to gardeners; some are classified Critically Endangered in the wild, but perhaps these are well established in cultivation. Data for each species include height at flowering, flowering time in the Southern Hemisphere, distribution in nature, and a descriptive paragraph covering

appearance, preferred habitat, cultivation, and ornamental uses. Most are illustrated with large (often full-page), high-quality color photos, many of which show the entire plant in its natural habitat—the most desirable sort of illustration for a book directed to the experienced plantsperson. Back matter includes lists of plants for particular garden situations, an extensive bibliography, a one-page glossary, and a good index.

This book is a desirable supplement to Manning, Goldblatt, and Snijman’s *The Encyclopedia of Cape Bulbs* which covers many more species but is less helpful on cultivation. It should send many of us to seedlists and bulb catalogs searching for additions to our collections.



Gardening with Bulbs



Tulips bloom at the Denver Botanic Garden. Read all about this great showcase for nature's wonders in our front page story. Photo by Sarada Krishnan.

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The Bulb Garden © 2011

The Bulb Garden is the newsletter of the Pacific Bulb Society (PBS). It is published, if enough articles are submitted, around the third week of each quarter and is available to PBS members. This newsletter provides gardening or bulb related articles, news of interest to members, and announcements of the PBS organization.

Editor: Jane Merryman, jane@sonic.net;

Co-Editor: Jennifer Hildebrand

Visit us online! www.pacificbulbsociety.org

Arnold Trachtenberg
140 Lakeview Avenue
Leonia NJ 07605

www.pacificbulbsociety.org