

# The Rose Vine

May, 2010  
Volume 43, Issue 2

*Penn-Jersey District of the American Rose Society's Quarterly Newsletter*

## *From the District Director's Desk—Kevin Glaes*



The Klima Education and Visitor Hall at the American Rose Center.  
That's Kathy Kozemchak in the garden. Photo by Bill Kozemchak.

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Check out our new  
website:

**[PennJerseyRose.org](http://PennJerseyRose.org)**

### **Spring 2010**

Roses are popping out and the buds are in the zillions! A spring that started with the biggest and most colorful (in my memory) of everything that has bloomed in succession (snow bells, crocus, tulips, forsythia, daffodils, flowering fruits trees, honeysuckle, iris, peonies) looks to keep going with the roses. Of course, we are running a bit early – maybe we should have an impromptu rose show in the King of Prussia Mall parking lot Memorial Day weekend!

A trip to Shreveport for the national convention and show got my juices flowing for the blooms to come “up

North.” The gardens there were in full bloom and looked great. The show was very good with great blooms in every class.

On the business side, the board spent the time together looking for ways to cut costs and improve membership. The trial memberships are helping us continue to see increases in the overall membership numbers. The conversion rate from trial to full membership is good. Elsewhere in this issue you will see more information about the trial memberships, but here is one aspect I want to emphasize. During our spring events and rose shows, every person who

joins your local society receives a free four-month ARS trial membership. See the trial membership article for details.

One cost-cutting measure we took was to save \$5,000.00 in printing costs by having the *Handbook for Selecting Roses* printed in a 4 ¼ x 5 ½ format. Take a regular sheet of paper (8 ½ x 11) and fold it in half and you have the size of it. The amount of information contained in the *Handbook* will remain the same. This will cause some consternation as we have become accustomed to the current size, but I believe we will adjust to it without much trouble.

The board also approved the position of Director of Planned Giving & Major Gifts. This position will be responsible for overall fundraising focusing on soliciting major gifts and providing help for those who wish to make donations through planned gifts.

The board approved additional measures including the adoption of a mission statement, a vision statement and a set of responsibilities for board members. The board also charged the Long Range Planning Committee to continue working on options for restructuring the board (numbers, how elected, etc.) and present

these options at the Atlanta convention in the Fall.

We hope Regional Director Elaine Adler has a speedy recovery from hip surgery. She is planning on judging at the June shows – there is an optimistic outlook! Best wishes, Elaine.

I hope you have the time to get out to meetings of your local society and most importantly, bring blooms to you local shows. The shows offer us great opportunities to recruit new members and nothing impresses the public more than a room full of blooms.  
**Kevin**

#### **ARS Publications**

The ARS is now making various publications available as “on-demand” publications. The books are not printed in large numbers and stored in a warehouse, but the copy you order is actually printed when you order it. This will mean a large savings for the ARS on all publications.

The **2010 Official List of Exhibitors and Judges** is available now. It is the same price as previous editions: \$20 print, \$15 download. To order your copy today please visit: <http://stores.lulu.com/americanrose> society. This is an ‘outside’ vendor. A link is provided on the left side (2010 Official List Now Available!) on the homepage at [www.ars.org](http://www.ars.org).

### **Upcoming Shows in the District Participate!**

#### **June 5**

#### **WEST JERSEY ROSE SOCIETY**

Moorestown Mall  
Contact – Gus Banks  
609 267-3809  
[jrsyrose@verison.net](mailto:jrsyrose@verison.net)

#### **June 5**

#### **GREATER HARRISBURG ROSE SOCIETY**

Harrisburg Mall.  
Contact – Ron Chronister  
717-766-2656

#### **June 6**

#### **PHILADELPHIA ROSE SOCIETY**

Morris Arboretum  
Contact – Pat Bilson  
610-644-1860  
[Patbilson@yahoo.com](mailto:Patbilson@yahoo.com)

#### **June 12 DEL-CHESTER ROSE**

#### **SOCIETY - Longwood Gardens**

Contact – Elaine Adler  
610-692-5631  
[eladler@sourcecodecorp](mailto:eladler@sourcecodecorp)

#### **June 12 YORK AREA ROSE**

#### **SOCIETY**

Grace Brethren Home, Cross Keys, PA  
Contact – Glenn Smith  
717 938-9991

#### **June 12-13**

#### **SOUTH PENN AREA ROSE**

#### **SOCIETY (SPARS) First Lutheran Church**

43 West Washington Street,  
Chambersburg, PA. Contact - Dale Martin  
717-369-3036  
[dmartin5222@comcast.net](mailto:dmartin5222@comcast.net)

#### **June 13 READING BERKS ROSE**

#### **SOCIETY**

Boscov's North  
Contact – Kevin Glaes  
610-926-4428  
[kevyg@frontiernet.net](mailto:kevyg@frontiernet.net)

#### **2010 PENN JERSEY FALL CONVENTION**

September 17-19, 2010, Eden Resort,  
Lancaster, PA  
Gus Banks 609 267-3809,  
[jrsyrose@verison.net](mailto:jrsyrose@verison.net)  
Elaine Adler 610-692-5631,  
[eladler@sourcecodecorp.com](mailto:eladler@sourcecodecorp.com)

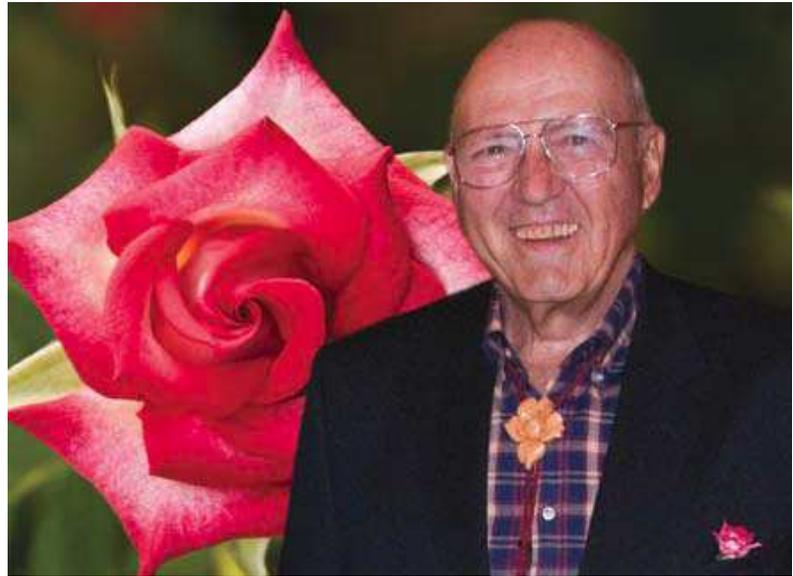
*Reprinted from the ARS,  
American Rose, May-June Edition.*

## Frank Benardella: 1932-2010 “The Will Rogers of Roses”

by John P. Mattia

It was early December when I last talked to Frank Benardella about roses. He was ebullient that day in describing the potential of his latest crop of rose seedlings that were just starting to show their first blooms. In fact, he told me, “This could be my greatest crop ever.”

Knowing that Frank was the harshest critic of his seedlings, I was convinced that day that he surely had some super roses among his new creations and that rosarians everywhere would be growing, many people considered Frank the top Miniature and Mini-Flora hybridizer in the world, a reputation built by the large number of Awards of Excellence (AOE) his roses earned over the last 25 years. I made plans with Frank that day for me to visit his Millstone Township, NJ, home after the holidays to



***Frank proudly displays his ‘Magic Show’ in his jacket pocket last summer when it was chosen as a 2010 Award of Excellence winner.***

photograph his new roses strutting their beauty in his state-of-the-art greenhouse.

Frank’s untimely death on January 30 was a shock. The rose world lost the consummate rosarian, the perfect rose gentleman, the down-to-earth guy willing to discuss roses with everyone. He soared to great heights in our hobby — as a leader in international and national rose societies, as a highly-competitive rose exhibitor who garnered national trophies and as the award-winning, trend-setting hybridizer who brought perfect and elegant-bloom form to a new generation of Miniature and Mini-Flora roses.

He was a star in the modern rose world. He counted among his friends the leaders in that world. One of these leaders, hybridizer Sam McGredy of New Zealand, lamented on his passing, “He was one of my closest friends. It’s all very sad.” Everyone in the rose world shares McGredy’s lament.

Frank always had time to share his love of roses with just about anyone, especially those just getting started in our great hobby. I was one of those “anyones” when I competed in my first Garden State Rose Society show in 1980, just as I began exhibiting roses. He approached me that day to talk about how to grow

super roses, and that conversation lasted for 30 years.

Don Ballin, Frank's rose friend for more than 40 years and, like Frank, a former ARS president, noted that he "had an innate ability to infuse everyone with enthusiasm and love for

the rose...Frank shared this passion with an overwhelming joy unequalled in any other rosarian I had ever met and his fervor translated into people worldwide sharing his passion."

Tommy Cairns, also a past ARS president and close friend, called Frank "the Will Rogers of Roses" because Frank never met a rose grower he didn't like. "Frank was an inexhaustible source of integrity and exuded the best elements of camaraderie," said Cairns. "Many rosarians, young and old, have been captivated by his gentle and knowledgeable dialogue as he seeded his rose-wisdom in their lives by bringing the joy of roses into sharper focus than before." This is the true legacy of a man devoted to a noble hobby, Cairns pointed out.

The beauty of roses zapped Frank in the mid-1950's. He and his life-long

buddy Ed Ward started growing roses and became key players and top exhibitors in rose societies in New Jersey. They soon started the Garden State Rose Society. Right from the beginning, Ward said, Frank was indefatigable in his commitment to rose society work. "He did whatever had to be done to make a society thrive." Frank started the Garden State's rose newsletter singlehandedly, organized rose shows and "did every job at one time or another that made our society vibrant," Ward recalled.

Frank felt the main purpose for growing roses was to "have fun." When he moved on to become the Penn-Jersey District director and American Rose Society president, he kept the view that "growing roses is a fun hobby" as his guiding principle. Ward noted that many credit Frank with starting the practice of "hospitality rooms," informal settings where rosarians can informally gather and discuss roses until the wee hours of the morning, as important parts of conventions. Ward also emphasized that Frank never let his success with roses go to his head. "He was the perfect rose friend. He always had time to discuss roses with anyone, especially those rosarians just getting into the hobby."

During the 1970's, Frank became one of the top exhibitors in the country, frequently winning ARS trophies at national rose shows. His trip to the ARS national convention in Denver is legend. He packed his roses in a car in New Jersey, and off he went with his wife, June, and his daughters, Karen and Jane. He drove 28 straight hours across the country from New Jersey to Colorado, making only quick whistle stops for necessities. He arrived just in time to enter the show and walked off with national trophies.

The ARS elected him vice president in 1975, and he assumed its presidency in 1977. He helped guide the ARS's relocation from Columbus, OH, to Shreveport, LA. He started the ARS Photo Contest, now an annual competition. He also helped engineer the introduction of the first U.S. rose stamp during his tenure.

His interest in hybridizing started when he collected self-pollinated rose hips and forced their stubborn seeds to germinate. His first introduction, a large-flower climber with classic Hybrid-Tea, exhibition-form blooms, was a self-pollinated creation. He introduced it commercially as 'Pelé',

after his pet dog, and the proceeds went to the ARS.

Soon after, he began hybridizing miniatures in his then-small, lean-to greenhouse. Visitors remarked how great they were, but Frank, the consummate exhibitor, never felt their form was good enough. One day, Sean McCann, the international rose columnist and a successful hybridizer in his own right, visited Frank in his greenhouse. A small, very dark-red mini bloom caught Sean's eye. McCann was agog over its beauty, and he urged Frank to send it to

Nor'East Nurseries for evaluation. Frank persisted that it "wasn't good enough." McCann replied, "You're nuts! It's one of the best roses I have ever seen."

Frank finally took McCann's advice and sent the seedling to Nor'East for evaluation, and the rest is history. They introduced the dark-red rose in 1985 as 'Black Jade', and it eventually earned Frank his first of 18 AOE awards. Greenheart Nurseries will introduce the 18th AOE winner this year as 'Magic Show'. Bill DeVor, who operates Greenheart, recalled that when his firm took over Nor'East, Frank voluntarily

stepped in and shared his vast knowledge of commercial rose culture with this firm, which is now the principal introducer of Benardella roses.

Jim Hering, also a former ARS president and the current chair of the AOE evaluation committee, presented Frank with the 2009 AOE award for 'First and Foremost' at the ARS miniature rose convention in Harrisburg, PA, last summer. Hering noted that Frank was a long-time supporter of the AOE trials, which were inaugurated in 1975, long before he became a hybridizer. In recognizing Frank's contributions to the AOE program, Hering said, "There has been no stronger supporter of, nor enthusiastic participant in the AOE program than Frank. His winning entries are a testament to his expertise as a hybridizer. However, more important than his talent as a rose breeder were his warm friendship and invaluable counsel with thousands of rosarians around the world. Frank was a true champion of the rose," Hering asserted.

Ludwig Taschner of Ludwig Roses in South Africa noted that Frank's success as an exhibitor logically led to his success as a hybridizer. "Frank only selected seedlings with

that perfect, high-peaked flower shape as suitable for trial." Taschner first received minis for trial from Frank in 1986. A few months later, when they started flowering, Taschner realized that Frank's roses had some very special varieties among them. "The florists in Pretoria loved these little roses. We planted more and more and exported them as cut flowers around the world." Taschner said that some of Frank's latest creations are coming into bloom right now at Lugwig's nursery, and they "will serve us as a living memory of this big, loveable man."

Two of Frank's very close hybridizer friends, Keith Zary of Jackson & Perkins and Tom Carruth of Weeks Roses, who share the limelight with him as top American rose breeders, had the opportunity to closely observe "Frank the Family Man." In addition to attending rose events around the world with the Benardellas, they made frequent visits to their New Jersey home, a place some call "Hotel Benardella" in recognition of all the rosarians Frank and his wife June hosted there.

Zary noted, "Having the honor to sit at Frank and June's table, we experienced to the full his

love of life and infectious sense of humor. Frank's passion, love of family and, of course, his extraordinary gift of breeding and exhibiting breathtaking roses made him a legend in the hearts and minds of all who had the privilege of knowing him. Frank will be deeply missed."

Carruth added, "Frank and June were an inspirational, complimentary pairing of life partners. Seems like no matter what end of the rose world I might travel to, Frank and June were there to welcome me with boundless friendship. The funny stories of our travels could fill volumes. His love for the rose and for life was limitless. I'm a better

person for having known Frank Benardella."

Frank's passing is a loss to the entire rose world. The grief of his rose friends is tempered by the legacy of Frank's love of the rose — his fabulous rose creations framed with the memories of his warm friendships with everyone who came in contact with him.

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Reprinted from the Rose Ecstasy Newsletter, Santa Clarita Valley Rose Society, Volume 19, Number 4, April 2010.

### **MORE BANG FOR THE BUCK WITH MINIATURE SPRAYS**

*By Kitty Belendez*

Miniature roses come in many sizes, shapes, and colors. I currently grow about 84 miniature roses, plus about 38 of the larger minifloras. I've been growing miniature roses for more than 20 years and have come to appreciate the many benefits they offer for the garden. They can be grown in small spaces and can be easily moved around the yard. The most productive miniatures are those that produce clusters of many blooms on each *long* stem. These clusters are also called candelabras,

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inflorescences, or sprays. In rose shows they are usually referred to as sprays.

Almost all of my miniatures are grown in 7 to 10 gallon plastic pots depending on the size of each variety.

Miniature roses thrive in containers if good potting soil is used. I prefer *Supersoil*, *Kellogg*, or *Dr. Earth* potting soils. I always blend 1/3 *Kellogg Gromulch* with the potting soil in the container. I also use water absorbing crystals in the pots so that the soil doesn't dry out during our intensely hot summers. I'd like to share with you some of the most prolific and disease-resistant miniature roses in my garden. These roses consistently produce sprays most of the year, and then slow down

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somewhat in the fall. The bloom color, year of introduction, and breeder are shown in parentheses.

**Kristin** (*Red Blend*, AoE 1992, Frank Benardella)

Hands down, Kristin is the absolutely most prolific rose in my entire garden. The short, compact bush is often covered in blooms. Some of the sprays can be huge with 10 or more blooms. The blooms seem to hold forever on the bush. Although barely any fragrance, this is a great rose for making potpourri because the buds don't fall apart.

**Irresistible** (*White*, 1990, Dee Bennett)

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I've been growing Irresistible for 20 years and couldn't bear to part with it. This rose consistently earns its space in my garden. I have three bushes. This is the only miniature rose that I grow in the ground. Although the blooms aren't huge, perhaps to about 1-inch in size, the bush can grow to about 2 or 3 feet tall and is often covered with many sprays. It can also grow quite happily in a 7- or 10-gallon container.

**Miss Flippins** (*Medium Red, 1997, Robbie Tucker*)

This rose loves to be pruned extremely hard at the end of the year. I prune her down to just a few inches, and she amazingly pushes out new canes of great length, and beautiful bloom-filled sprays. The clear red **Page 2 Rose Ecstasy Santa Clarita Valley Rose Society Volume 19 Number 4 April, 2010** many clusters of blooms. The foliage is a glossy medium green and stays clean of mildew and other diseases.

**Arcanum** (*Apricot Blend, 2000, Robbie Tucker*)

The creamy blooms on this short bushy mini rose are edged in an orangy-color

and it reminds me of the Dreamsicle ice cream bar.

This rose will take a little extra care in spraying for mildew, but the unique color is worth it to me. Arcanum produces many sprays and some individual blooms on long stems.

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## Welcome to Lancaster, PA

The **2010 Penn-Jersey District Convention** is being held **September 17-19, 2010**, at the **Eden Resort in Lancaster**. The Convention will be organized and sponsored by the District rather than an individual society this year. The Pittsburgh Rose Society had offered to host our Convention, but found it was not possible to contract with a hotel for the necessary space at an affordable price. It was decided that the Convention would be held at the site of our Winter Rose Getaway in Lancaster which is a central location for the entire District and offers a more reasonable price structure.

While Penn-Jersey has often met in Lancaster, it has always been in the Winter. This time those attending will have the opportunity to explore many of the other attractions of the area as

well as the plentiful shopping venues. **Kevin Glaes, our District Director**, will be checking into local events and providing information for those attending. The **District Show will be Saturday, September 18<sup>th</sup>**, followed by afternoon programs and the **Awards Dinner** that night. **Jeff Ware, American Rose Society Executive Director** will be the **dinner speaker**. There will be plenty of time to shop and explore on Friday before the dinner and social hour in the evening where we will have some fun with rose games. The **Annual District meeting** will be held **Sunday Morning** following a buffet breakfast.

The Convention Committee is composed of representatives from all over the District.. If you haven't already been tapped for a job, please contact one of those listed below and offer your help. This is truly a district wide effort

Convention Co-Chairs  
**Elaine Adler and Gus Banks**

Registration  
**Georgiana Papale**

Hospitality  
**Mary and Bill Slade**

Program Coordinator  
**Nancy Redington**  
Raffle

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Marion & Henry Forstenhausler, Donna Smith

Elaine Adler

Pat Bilson

Judges-Artistic Pat Bilson

Trophies John Consiglierio

District Trophy Chair Bill Kozemchak

Schedule-Horticulture Georgiana Papale

Properties Mike Wrightstone and J. R. Smith

Show Chair Georgiana Papale

Chief Clerk Mike Wrightstone

Judges-Horticulture

Schedule-Articles

2010 PENN-JERSEY DISTRICT CONVENTION REGISTRATION:

Reserve rooms directly with Eden Resort Inn, 222 Eden Road, Lancaster, PA 17601. Phone 717-569-6444. Rates are \$119.95/room/night (up to four people per room). Mention the PA/NJ District America Rose Society meeting Group #103700 to get the special room rates.

Reserve rooms by August 17, 2010!!!

Registration for the Penn-Jersey District Convention on September 17-19, 2010

Name(s): \_\_\_\_\_ Phone: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_

E-mail: \_\_\_\_\_

Registration		\$35.00 each	\$ _____
Dinner (Friday)	Poached Salmon	\$30.00 each	\$ _____
	Sliced Roast Top Sirloin of Beef	\$30.00 each	\$ _____
Dinner (Saturday)	Chicken Marsala	\$28.00 each	\$ _____
	Prime Rib of Beef	\$35.00 each	\$ _____
Breakfast	All-American	\$13.00 each	\$ _____
<b>Total Amount Enclosed</b>			<b>\$ _____</b>

Make check payable to Penn-Jersey District and mail to: Georgianna Papale, 2371 Perricrest Dr Pittsburgh, PA 15220 msgeorgi@ix.netcom.com

Anyone willing to help clerk at the show contact Mike Wrightstone Mwrightsto@aol.com 717-774-7208

Reprinted from the Philadelphia Rose Society, May Newsletter

## 2009 ARS Photo Contest Winners from the Penn-Jersey District

As promised, here are the winners of the ARS Photo Contest from the PJ District. The ARS asked not to publish them until they appeared in the May/June issue of the magazine. Joe Makosch also had an HM in class 11-5 with Sam Trivitt.



**Above from left:** Summerwine by Juluia Saurbaugh 1<sup>st</sup> place class 4, Kozemchak Garden 1<sup>st</sup> place class 10, Halo Today HM class 5, and Priscilla Burton HM class 3 by Bill Kozemchak.



**From top left:** Crystalline 1<sup>st</sup> place class 13-1, Gemini 2<sup>nd</sup> place class 13-1, Longwood Gardens 1<sup>st</sup> place class 13-4, Terry Palise Arrangement 1<sup>st</sup> place class 13-3, Nancy Redington Arrangement. 2<sup>nd</sup> place class 13-3, Lew Shupe Arrangement 3<sup>rd</sup> place class 13-3, and Longwood Gardens HM class 13-4 by TOM MAYHEW. Marcia Sanchez-Walsh Arrangement 2<sup>nd</sup> place class 7, Cordelia Sanchez-Walsh Arrangement 3<sup>rd</sup> place class 7 and Diane Sommers Arrangement 2<sup>nd</sup> place class 8 by BILL KOZEMCHAK. Longwood Gardens HM class 10 by GUS BANKS.

## The 4-Month ARS Trial Membership Programs

**The Free 4-Month Trial Membership** - is for **new** Non-ARS, local society members. "New" is the key word here. Every member that joins a local society and is not an ARS member, receives a FREE 4-month Trial Membership to ARS. This is a great recruitment tool for the local societies to use when trying to sign up new members: "Join our society today and receive a FREE 4-month trial membership to the American Rose Society – an \$86 value!!" The local society is NOT charged for this. It is FREE!!

However, the local society MUST send the contact information, including e-mail address, to Laura Pfender [laura@ars-hq.org](mailto:laura@ars-hq.org), at Headquarters.

**The \$5.00 4-Month Trial Membership** – is available for existing local society, non-ARS members. The \$5.00 fee offsets processing and mailing costs. ARS does not make money on this offer. For this small fee any local society member who is not already an ARS member can try ARS out and hopefully like ARS enough to renew at the full membership rate when the trial membership expires.

**In addition:** All local societies may also extend this \$5.00 4-month trial membership to any Non-ARS member attending a rose or garden event that they are hosting. This is a special offer to Local Societies. The general public, (Non-ARS members) will be offered the 4-month trial membership for a fee of \$10 and this offer is now posted on the homepage of the ARS website. Of course if a person joins the local society the 4-month trial membership is free. However if you have someone who does not want to join the local society, they can still be offered a 4-month trial membership to ARS for just \$5.00. Applications are available on the website or from Laura Pfender.

### **Four-Month Trial Members receive:**

- **2 issues of American Rose magazine, \$16 value.** The only magazine devoted exclusively to roses and rose culture, these bi-monthly, full color, 84-page issues feature informative articles and beautiful color photography for beginners and experienced rose growers alike. **View a free issue online at [www.ars.org](http://www.ars.org).**
  - **Free online access to four quarterly bulletins, a \$45 value.** Previously available by subscription only, the *Mini/Mini-Flora Bulletin*, *Old Garden Rose & Shrub Gazette*, *Rose Arrangers' Bulletin*, and *Rose Exhibitors' Forum* are all now available online, [www.ars.org](http://www.ars.org), for **free** to all ARS members, **with the members' password. The members' password is listed on page 5 of each issue of American Rose Magazine.**
  - **Free or reduced garden admissions, a \$25 value after just 3 uses.** With the Reciprocal Garden Admission program, **your ARS membership card is your ticket to free or reduced admission to over 200 Botanical gardens, conservatories, and arboreta nationwide.**
  - **Discounts of up to 30% at merchant partners.** The ARS Member Benefit Partner Program offers discounts at 14 merchants with new partners being added continuously.
  - **Free advice from Consulting Rosarians.** The ARS Consulting Rosarians program connects members with expert rosarians that provide free assistance with your rose questions.
  - **A four-month trial membership is valued at \$86 for only \$5!**
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Reprinted from the May 2010 edition of  
*Scientific American*

## **More Food from Fungi? Crop-enhancing microbes challenge genetic engineering**

**By Michael Tennesen**

To feed an exploding global population, scientists have called for a doubling of food production over the next 40 years. Genetic manipulation might seem the best way to quickly boost characteristics essential to plant growth and crop yields. New findings from different laboratories, however, suggest that fungi, bacteria and viruses could be an exciting alternative to increase agricultural productivity.

Scientists have long known that microbes can work symbiotically with plants. For instance, mycorrhizal fungi, which are associated with 90 percent of land plants, extend from roots to bring in moisture and minerals in exchange for plant carbohydrates. But microbes have recently been found among plant cells themselves and seem to confer benefits, such as more efficient photosynthesis and increased ability to fix nitrogen from the air. In fact, Mary E. Lucero, a biologist at the U.S. Department of Agriculture's Jornada Experimental Range in Las Cruces, N.M., believes that plants actively recruit these microbes rather than simply being passive hosts for them.

In the lab, Lucero has given this recruitment a hand by transferring fungi from four-wing saltbush to grama grass, which is important for grazing cattle. The fungi-infused grass grew larger and produced more seed, probably by improving nutrient uptake and water usage, she speculates. Lucero also points out that harnessing microbial help for capturing nitrogen could reduce the need for chemical fertilizers. "It is far easier, more efficient and less expensive to inoculate a plant with a beneficial fungi than to come up with a genetically modified species," she remarks.

Rusty Rodriguez, a microbiologist with the U. S. Geological Survey's Biological Resources Division in Seattle, is trying to

tackle another agricultural demon: excessive heat. In experiments to improve the ability of tomato plants to resist high temperatures, he inoculated them with fungi taken from plants near hot springs in Yellowstone National Park. The result: tomatoes that can grow at 148 degrees Fahrenheit. "That's about the internal temperature of a medium cooked prime rib," Rodriguez notes.

Furthermore, by isolating a virus in the fungus, he discovered a three-way symbiosis that was required for thermal tolerance. "Without the virus the plants could handle only about 100 degrees F," Rodriguez says. The fungus and virus also conveyed heat tolerance to rice and wheat, a process that could not only boost yields but also help crops fend off the effects of climate change.

Analyzing plants from beaches, deserts and polluted areas, Rodriguez has also isolated microbes that help plants resist salt, drought and heavy metals. Curiously the same fungi taken from plants living in unstressed areas did not confer tolerance. "It has to be the right microbe from the right habitat," Rodriguez says. Choosing microbes from heat-stressed areas could boost rice production, which drops 10 percent for every 1.8 degrees F of warming. Once acquired, however, stress-tolerant microbes can be passed in seed coatings to the plant's progeny.

Christopher L. Schardi, a plant pathologist at the University of Kentucky who studies certain species of tall fescue grass, observes that the mutualism between microbes and plants has agricultural drawbacks, too. Many microbes in plants produce biologically active alkaloids, which repel insects, birds and herbivores. In fact, in the early 1950s grazing livestock picked up a disease related to alkaloids in grass known as fescue toxicosis. It can induce tremor and stupor, as well as an aversion to further grazing. "It costs the livestock industry about \$1 billion a year," says Schardi, adding that producers raising grass-fed cattle are now sowing cultivars with nontoxic fungi.

Identifying plant microbes is not easy, because microbial cells are embedded in plant tissue. Lucero uses scanning electron

microscopy and new pyrosequencing techniques to identify the DNA of microbes in plant tissue.

The intensive effort, Rodriguez believes, will pay off by helping farmers meet future food demands. Modifying traits genetically is expensive, does not always work and generates a fair amount of consumer backlash. Improving crop production with the plant's own microorganisms might be

more successful on a host of fronts. Says Rodriguez: "We're trying to duplicate the way it works in nature—using not genes but entire genomes from the plant's own microbial community."

*Michael Tennesen is a science writer based near Los Angeles.*

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**PENN JERSEY DISTRICT OFFICERS AND STAFF**

**District Director:**

Kevin Glaes  
610-926-4428  
[kevyg@frontiernet.net](mailto:kevyg@frontiernet.net)

**1st Assistant Director:**

Mary Slade  
(717)939-6463

**2nd Assistant Director:**

Joan Singer  
717-352-2212  
[joandrandy@supernet.com](mailto:joandrandy@supernet.com)

**Secretary:**

Nancy Redington  
717-264-6488  
[Rosered1@comcast.net](mailto:Rosered1@comcast.net)

**Treasurer:**

Georgiana Papale  
(412)563-6755  
[msggeorgi@ix.netcom.com](mailto:msggeorgi@ix.netcom.com)

**Chairman, Nominating Committee:**

Nancy Redington  
717 264-6488  
[Rosered1@comcast.net](mailto:Rosered1@comcast.net)

**District Chairman of Judges:**

Elaine L. Adler  
610-692-5631  
[eadler@westtown.org](mailto:eadler@westtown.org)

**Chairman of Arrangement Judges:**

Patricia A. Bilson  
610-644-1860  
[patbilson@yahoo.com](mailto:patbilson@yahoo.com)

**Chairman of Consulting Rosarians:**

Gustave R. Banks  
609-267-3809  
[Jrsyrose@verizon.net](mailto:Jrsyrose@verizon.net)

**Officers Elected and appointed September 2006 for 3 year terms**

**Chairman of Mid-Winter Convention:**

Curtis Aumiller  
717-612-1575  
[Caumiller1@verizon.net](mailto:Caumiller1@verizon.net)

**District Trophy Chairman:**

William Kozemchak  
215-945-8098  
[pinkykoz@aol.com](mailto:pinkykoz@aol.com)

**District Chaplain:**

Fr. Gervase Degenhardt  
412 682-6430 x240  
[gervase@capuchin.com](mailto:gervase@capuchin.com)

**District Membership Chairma**

Iliana Okum  
609-298-4160  
[wjsrose@msn.com](mailto:wjsrose@msn.com)

**Historian:**

610 488-1817  
[pitkind@earthlink.net](mailto:pitkind@earthlink.net)

**Roses in Review Coordinator:**

Diane Wilkerson  
732-219-0339  
[hptownrose2@aol.com](mailto:hptownrose2@aol.com)

**Historian:**

**Pat Pitkin**  
618-477-1817  
[pitkind@earthlink.net](mailto:pitkind@earthlink.net)

**Webmaster:** Kevin Glaes

[kevyg@frontiernet.net](mailto:kevyg@frontiernet.net)

**The Rose Vine Editor:**

Terry Palise  
609-896-2011  
[cpalise@verizon.net](mailto:cpalise@verizon.net)



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