American
Floral
Endowment

1989-Annual Report

Table of Contents

The American Floral Endowment is a non-profit corporation established to secure contributions for funding research and education programs relevant to the floriculture and environmental horticulture industries, the results of which will benefit the general public.

American Floral Endowment
37 Camelot Drive
Edwardsville, Illinois 62025 USA
618-692-0045
FAX 618-692-4045

Introduction

The American Floral Endowment represents an industry older than America itself – doing for the industry what no single individual or company can do. Organized in 1961, it is the *only* industry-wide, industry-based organization *totally* dedicated to funding research and education programs for floriculture and environmental horticulture.

While the Endowment is growing through the generous contributions of many industry members, it must grow faster if it is to meet the ever-increasing need for a solid business foundation. *More and more, consumers are demanding quality at every level.*

A major decision during the past year was development of a patent policy. Because of its unique relationships, it is felt the Endowment is in a position to assist institutions in realizing commercialization of certain research products. It is believed that under the right circumstances a patentable item may eventually generate additional dollars that can be put into further research for a better product with which to serve the consuming public.

Representing all segments of the industry, the Board of Trustees share a sense of responsible and dedicated professionalism of which we can all be proud. It was with pride and pleasure that I accepted the chairmanship for the coming year, and even more so to be able to extend thanks and appreciation to the Trustees for sharing their resources, both mind and spirit.

Finally, on behalf of the Board it is special for me to extend the most heartfelt thanks and appreciation to the contributors – our partners in research and education for a better floral industry.

Warmest best regards to all for a healthy and prosperous 1990.

Robert C. Dewey
Chairman

"...contributors – our partners in research and education..."

Board of Trustees 1989-90

Board of Trustees 1989-90

Financial Report 1988-89

Statement of Assets

	6/30/89	6/30/88
Cash and Short Term Investments	$ 246,666.55	$ 384,346.66
U.S. Government & Agency Bonds (Market)	1,944,302.75	1,534,648.50
Corporate Bonds (Market)	289,127.50	280,750.00
Common Stocks (Market)	1,692,737.50	1,582,162.50
Total Assets	$4,172,834.30	$3,781,907.66

Earnings & Disbursements

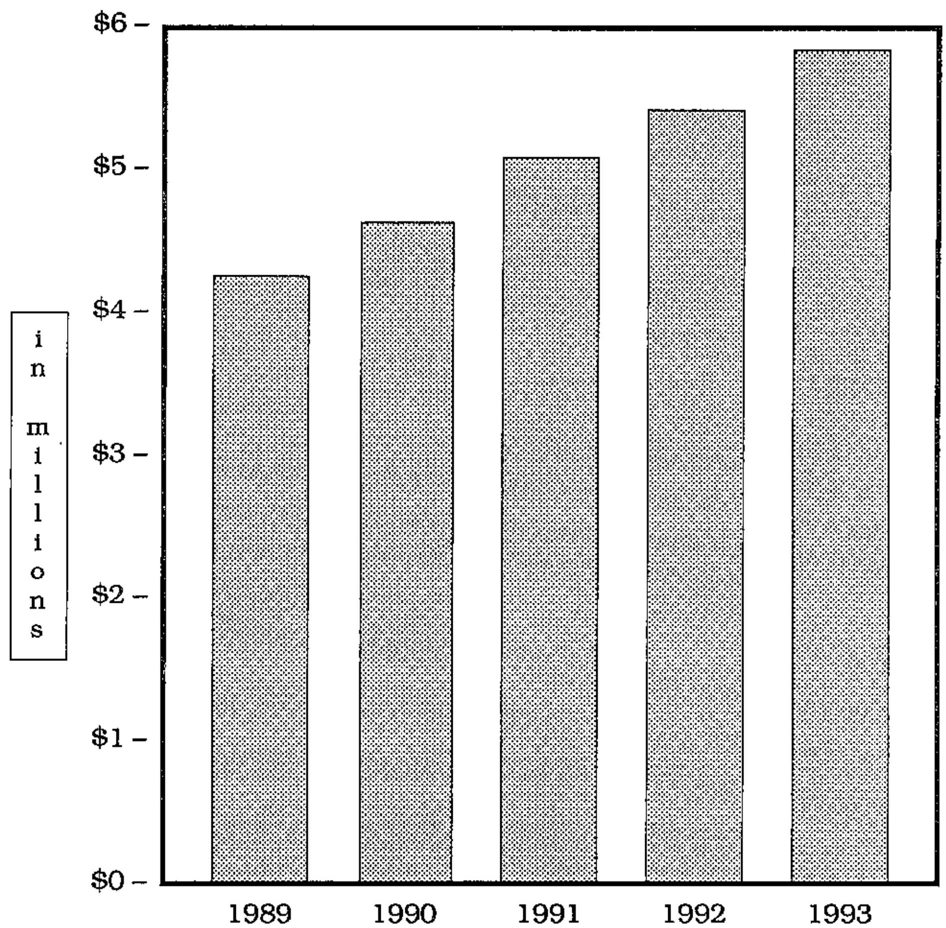
Balance	$ 186,339.22	$ 159,941.15
Income:		
Dividends	45,410.50	40,245.50
Interest	218,466.14	200,927.02
Designated Contributions	105,779.00	48,700.00
Allocation of Capital Gains	18,291.00	62,463.57
Total	$ 574,285.86	$ 512,277.24
Disbursements:		
Bank Management Fees	$ 14,055.22	$ 12,885.46
Grants	424,721.32	313,052.56
Balance	$ 135,509.32	$ 186,339.22

Treasurer's Comments

The Endowment's resources continue to grow as does the income which is used to fund industry research. The Endowment is in solid financial condition but will face challenges in the years to come to continue to control administrative costs while enhancing investment yields and corpus growth.

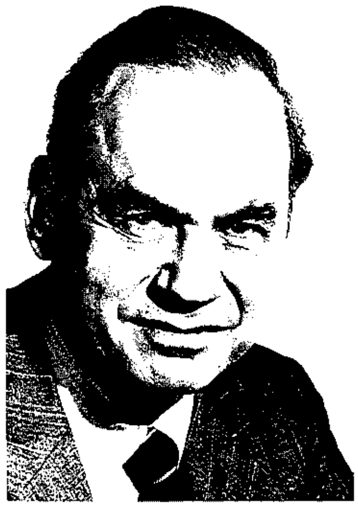
KENNETH R. ROYER
Treasurer

American Floral Endowment



Corpus Projection

1989 Highlights



Edwin Newman Featured at Annual Meeting

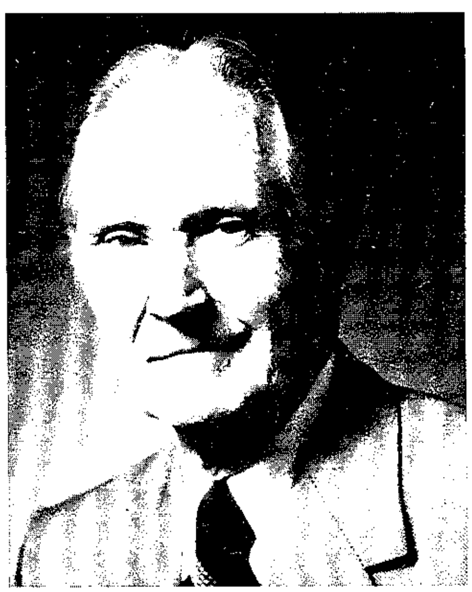
Co-sponsored by Florafax International, retired NBC journalist Newman was the featured speaker at the Endowment's Annual Meeting luncheon.

Ankele & Preston Retire

Retiring after nine years on the Endowment Board of Trustees, including the chairmanship for the past two years, Felix Ankele was presented with a sterling plate and praise for his leadership during the 1989 Endowment annual meeting luncheon. He was honored with a standing ovation.

Special expressions of thanks and appreciation were also extended, along with a silver bowl, to Walter Preston for ten years' service on the Board of Trustees, including two years as Secretary.

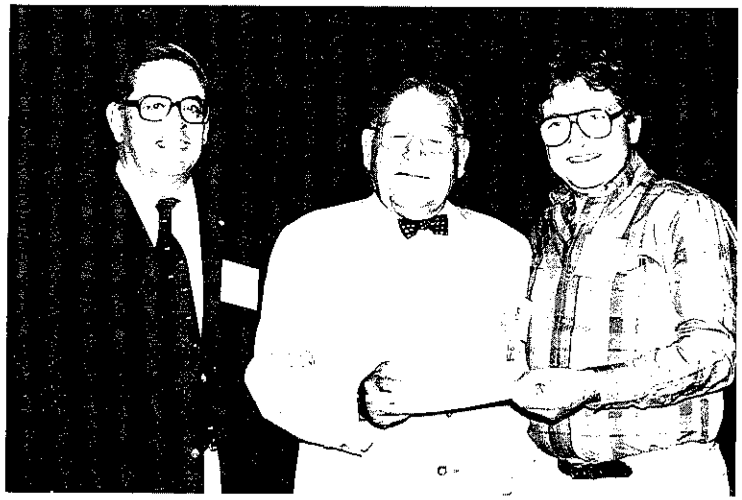
James Irwin and Ole Nissen were elected to replace Ankele and Preston.



Felix Ankele

Walter Preston

Two Major Donations Received



During the SAF meetings in Chicago, July 26-29, Colombia Flower Council and Asocolflores representatives, Jorge Uribe (r) and Jose (Pepe) de la Torre (l) presented newly-elected Endowment Chairman Robert C. Dewey with a check for $30,000 to support the Endowment's Statistical Data Gathering and USDA New Crops Programs.

During Century Dinner XIII John Borden, Florists' Transworld Delivery Association Executive Vice President (r), presented the Endowment with a check for $50,000 to support the Endowment's Statistical Data Gathering Program. Todd Bachman, representing the Endowment, accepted the check.

Century Dinner XIII

More than 200 people attended Century Dinner XIII on August 22 during the FTD convention in Honolulu. Underwriting much of the evening's events were the Hosts ($1,000 contribution) and Sponsors ($500 contribution). Guests paid $100 per ticket.

Hosts:
Felix and Freddy Ankele
Crisa Corporation
Florists' Transworld Delivery Assn.
The John Henry Company
Colombia Flower Council
Floral & Nursery Times
Pete Garcia Company
Highland Supply Corporation

Sponsors:
American Floral Services, Inc.
Arnold & Porter
Berwick Industries, Inc.
Buchbinder Brothers
Delaware Valley Wholesale Florist, Inc.
DWF Wholesale Florists
Florists' Mutual Insurance Co.
Flower News
Moore Paper Boxes
A.L. Randall Company
Smithers-Oasis
Syndicate Sales, Inc.

The Endowment wishes to thank FTD for the photos from Century Dinner XIII.

Chairman Don and Judy Flowers

(l-r) Bret and Cheryl Clausen, Bob Abrams

Product Contributors:

The following companies donated the products making it possible to have the floral decorations that make an evening both beautiful and gracious:

Floral Resources/Hawaii, Inc.
Glad-A-Way Gardens, Inc.
Hawaii Tropical Flower and Foliage Assn.
The John Henry Company
Knud Nielsen Company, Inc.
Manatee Fruit Company
Smithers-Oasis

In addition to Hosts, Sponsors and Product Contributors, the Endowment wishes to extend grateful thanks and appreciation to:

General Chairman
Don Flowers

Don Stothart, *Decorations Chairman*
Wayne Babb
John Cason
Betty and Wayne Early
Richard Horn
Jennie and Earl Irey
Jane and Richard LeVieux
Jack Smith
Bruce Thompson
Sets Umeda

Brook Jacobs, *Invocator*

Chairman Don Flowers greeting guests upon arrival.

(l-r) Ellie McNamara, Mrs. and Mr. Doug Hagemann

Century Dinner XIII Photos

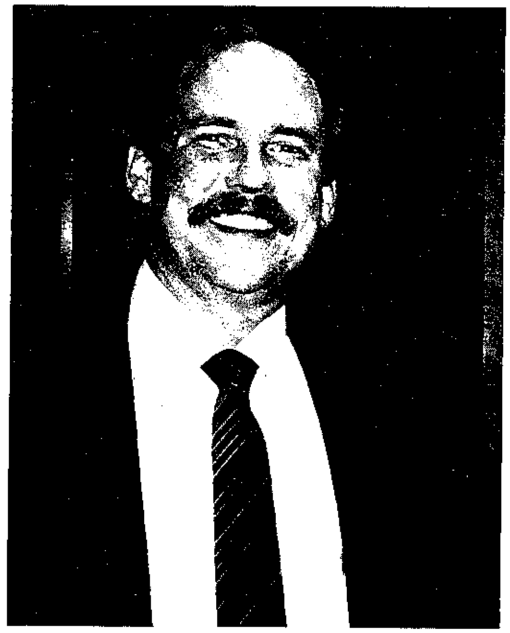
Ben Veldkamp and Lincoln Leong

Standing l-r: Nancy Ankele, Fredrika Ankele, Martha White, Margaret Darmon, all representing Felix and Freddy Ankele. Seated l-r: John R. Wilkins and Lee Berenbaum, Delaware Valley Wholesale Florists.

(l-r) Barbara Bachman, Todd Bachman, John Borden

Century Dinner XIII Photos

Tony and Gracie Fiannaca



John Dramm

Ankele and Simmons Elected Trustees Emeriti

The Endowment Bylaws provide that, "Trustees Emeriti may be elected by the Board, and shall be former Trustees of the Endowment who have demonstrated a significant interest in or contribution to the welfare, interests, development and improvement of the Endowment..."

Both Felix Ankele and Mabel Simmons are former Chairmen of the Endowment Board. They join just three others who have been so honored: John E. Dramm, John Henry Dudley, and O. Ben Haley, Jr.

Felix Ankele

Mabel Simmons

Tributes

Tributes are available to honor individuals, families and companies. Tributes provide a tangible way of expressing care, saying thank you for a friendship or acknowledging a customer.

A minimum contribution to the Endowment of $500 is required to establish a tribute. Once established, additional contributions in any amount may be received. The family or corporate entity is always notified.

Corporate Tributes

Corporate Tributes are designed to provide a vehical for recognition of floral industry firms and corporations. Since its inception in 1986, the following organizations have been so recognized:

Bay City Flower Co.
Half Moon Bay, CA

Clackamas Greenhouse
Aurora, OR

• R.O. Cowley Wholesale Florist
Pittsburgh, TX

Burdette Coward & Co., Inc.
Punta Gorda, FL

Cremer Florist
Hanover, PA

Dillon Floral Corporation
Bloomsburg, PA

Hardin's Wholesale Florist Supply
Liberty, NC

Hartzell Flowers, Inc.
Dayton, OH

John Klaus & Sons Greenhouses
Greenwood, MO

Mazzanti Carnations
South San Francisco, CA

• H. Nakano & Sons
Redwood City, CA

Park Floral Co.
Englewood, CO

Tietze Wholesale
Dallas, TX

Weber's Greenhouses
Milwaukie, OR

Wolfe the Florist
Waco, TX

• Established in 1989

Jim Nakano
H. Nakano & Sons

Richard and Vanita Cowley
R.O. Cowley Wholesale Florist

Living Tributes

Living Tributes are testimonials to outstanding achievement and regard from fellow workers and associates to honor a living member of the industry. All Living Tributes recorded within the Endowment as of December 1989, follow:

Carl Baldesare, Sr.
Charles Barr
I.W. Bianchi
† Z.D. Blackistone
Louis J. Brand
† Albert H. Burki
Delmar E. Demaree, Jr.
Robert C. Dewey
John Henry Dudley
Paul Ecke, Sr.
George Elliott
John O. Finn
Frank Fredenhagen
† John W. & LaVerne B. Giles
Hazel Grill
O. Ben Haley, Jr.
† Howard J. Hook
† Francis Hopper
† Joe Hopper
Dan Irons
Martha J. Keller &
Herbert Rothwell
† Harrison Kennicott, Jr.
L.R. "Bud" Kintzele
John Knipe
† Leonard Koehler
† Prof. Alex Laurie
Elma Lundahl
Edward & Grace Lutey
Robert L. Orth
† Samuel S. Pennock III
Gustav H. Poesch
Jack W. Redditt
Kenneth Royer
Mel Schwanke
R.H. "Hank" Sciaroni
† Kenneth F. Short
† E.G. Thornton
† Erwin H. Weder
Milton M. Weiss
Olin A. Wetzel
J.F. Wilcox Family

† Deceased

Memorial Tributes

Industry men and women, as well as friends and families, can be remembered in perpetuity through Memorial Tributes. As of December 1989, the following have been so honored:

Mr. & Mrs. S.C. Abbott
David Abrams
Adamo-Loweke
Robert Alenius
Irving S. Allen
Clarence M. Amling
Otto Amling
Henry C.A. Bachman, Jr.
Mr. & Mrs. Dewitt Barber
Clair Barrett
John Barter
Matthew Bartindale
Andrew Benson
Harry Bernard
J. Elmer Betty
Henry J. Betz, Sr.
Clarence J. Bickes
Daryl Bordine
Frank Brautigam
Tommy Bright
Irma F. & W.E. Callaham
Robert Callaham
Oscar G. Carlstedt
Denis R. Celleghin
Roman J. & Florence A. Claprood
Bertha Spence Cook
William Coy Kendall
* James Crissey
W.L. Crissey
Raymond B. Crowley
Rodger Davidson
William E. DeLoache
Mrs. Fern Demaree
Nicola & Pasquale DeSantis, Sr.
Ira Doud
Eugene R. Dramm
Floyd B. Dreher
Donald Dunbar
Magdalena Ecke
Austin S. Edgar
Walter J. Engel, Sr.
Clyde Epperson
Albert Ferris
Pete Franconi, Sr.
John Furrow, Sr.
Irving B. Garber
Walter Gardner
D.S. Geddis, Sr.
John W. & LaVerne Giles
Walter Gills
John Patrick Glass, Jr.
Louis B. Glick
Romaine Glisson
John G. Glodt
Stanley A. Goldman
Douglas R. Gordon
H. "Granny" Granovitz
Joe & Lily Green
Joseph N. Gregoire, Sr.
Cornelius J. Groen
Lavena M. Groen
Adolph E. Gude, Sr.
Granville Gude
William F. Gude
Samuel & Huldah Hagen
Mr. & Mrs. Alexander Henderson and Frederic Metcalf
E.G. Hill & Earl Mann
Joseph H. Hill
Albert L. Hoekstra
Simon Hoekstra
Jay Hogrefe
Herman Hollberg
Leo Hollberg
Herbert Holm
D. E. Hopkins
Otto G. & Anna M. Hupfel
Walter M. Hupfel
Arthur Ito, Jr.
Edward Jacobson
Joseph Johnston, Jr.
David L. Jones
Pauline Modlin Jones
Tom Joy
Ralph H. Kapp
Mary Jane Kennicott
Jack Rhodes Kervan
Leland T. Kintzele
Louis Kintzele
D.C. Kiplinger
Kiyo Kitayama
Masuko Kitayama
Electa Koehler

James Crissey

William Strickland

Jerome Krivit
Paul Krone
Yoke Kuromi
Kenneth Lawlor
John Liesveld
John R. McGinley
Bertrand G. McGinnis
Wake McLellan
Melvin Mack
Ed Manda
George Mangel, Sr.
Gurney Mann
Joseph T. Markow
Mary Ann Markwood
Jack Mayesh
Joseph Merritt, Sr.
W.J. Messmer
Richard V. Mikesell
Mary M. Mikuriya
William G. Minich, Jr.
Stanley C. Minshall
Jim Morrell
Leon Moskatel
Barbara B. Mosmiller
Frank, W.E. & F.J. Mosmiller
Col. Walter Mosmiller, Jr.
Rollo Mueller
G. Edwin Murphy
Albert J. Neill
Mr. & Mrs. H. D. Neve
Hannah Niday
Ross Nielsen
Kenneth Noppe
Mr. & Mrs. Albert Oelschig, Sr.
Pop Patterson
Charles F. Pennock
S.S. Pennock III
S.S. Pennock, Jr.
S.S. Pennock, Sr.
Harry L. Peters
Peter B. Pfahl
Priscilla Fergusson Phelps
Leno Piazza, Sr.
Andrew A. Pierson
Albert Pochelon
Oswald Preuss
Peter Pugliese
Harvery Radus
A.L. Randall
James Rathmell
Charles O. Reiff, Jr.
Curtis W. Richardson, Jr.
Rafael Rigual
Jerry L. Robertson
Arthur Robbins
Fritz Roll, Jr.
Hans Rosacker
Harry W. Roth
Robert O. Saunders
Jack Savarese
Joseph Shaner
Joe Shinoda
Peter Shinoda
** Yoshiko Shinoda
Robert Q. Shoch
Kenneth F. Short
J.S. Skinner
R. Earl Slye
Vernon L. Smithers
Harold H. Sorensen
William H. Stimming
* William Strickland
Albert Strumph
Neil Wade Stuart
Leo Stuhldreher
Daniel V. Sugrue
Shizuo George Suyeyasu
Walter F. Swartz
Josephine & Anton Sykora
Fred M. Tayama
Mitsuo Tokunaga
Richard Tokunaga
Fred Tredup
Charles "Bob" Tryon
John Tuefel
Barbara Euser Van Namen
Tony Van Namen
Vincent Vanni
John H. Walker
Adolph "Ade" Weberg
Erwin Weder
Herbert R. Weder
Robert Weidner
Henry Weiland
Paul E. Weiss
James C. Welch
Fred Wesemeyer
June Wesemeyer
Joseph C. Wetzel
Judy Wetzel
George V. Wienhoeber & Rudolph Scheffler
Roy F. Wilcox
George Wilke
Hubert Wolfe
Thomas J. Wolfe & George Wolfe, Sr.
Luther Wright
Harold F. Yoder

* Tributes established 1989

** Tribute established in 1988 but photo unavailable for publication last year.

Yo Shinoda

Contributor Recognition

All individuals and organizations making a contribution to the Endowment within the last year, or those contributing a minimum of $500, are listed in this report. All listings are according to levels reached as of December 31, 1989.

Designations have been assigned various levels of giving. Contributions are cumulative and provide a practical way of building individual and organizational participation.

Recognition plaques are presented annually to those reaching different levels, beginning with the Guardian level. Designations include:

Builders	$25,000 and above
Benefactors	$20,000 to $25,000
Patrons	$15,000 to $20,000
Founders	$10,000 to $15,000
Protectors	$ 5,000 to $10,000
Guardians	$ 2,500 to $ 5,000
Vanguards	$ 1,000 to $ 2,500
Sentinels	$ 500 to $ 1,000
Sponsors	$ 100 to $ 500
Givers	under $100

Since this report was prepared as of December 31, some contributors recognized for a given level at the Annual Meeting in July have moved up a level. The current status is recorded herein.

Special Awards

In 1988 three new awards were established to recognize several major levels of giving to the Endowment:

The Gold, for $50,000 - $75,000
The Diamond, for $75,000 - $100,000
The Platinum, for $100,000 and above

Recipients through 1989 are:

Platinum:
Albert H. Burki Foundation
Florists' Transworld Delivery Association

Diamond:
Asocolflores/Colombia Flower Council

Gold:
American Floral Services, Inc.
Paul Ecke Poinsettias
Teleflora, Inc.
Yoder Brothers, Inc.

Builders

American Floral Services, Inc.
Asocolflores/Colombia Flower Council
Bachman's, Inc.
George J. Ball, Inc.
Estate of Arthur Blome
Albert H. Burki Foundation
The Claprood Companies
DWF Wholesale Florists
Paul Ecke Poinsettias
Paul Ecke, Sr.
Florafax International, Inc.
Florists' Mutual Insurance Co.
Florists' Transworld Delivery Assn.
Gude Brothers Company
Highland Supply Corporation
Manatee Fruit Co.
Mikkelsens Incorporated
Estate of Col. and Mrs. Walter Mosmiller, Jr.
Pennock Co.
Pittsburgh Cut Flower Co.
A.L. Randall Co.
Smithers-Oasis
Society Of American Florists
Sunburst Farms, Inc.
Syndicate Sales, Inc.
Teleflora, Inc.
Van's, Inc.
WFR, Inc.
Wolfe The Florist, Inc.
Yoder Brothers, Inc.

On hand to receive Endowment recognition plaques for the Builder level of giving during the annual meeting luncheon, Westin Hotel, Chicago, were (l-r): Steve Otte, Florists' Mutual Insurance Co.; Paul Ecke, Jr., receiving for Paul Ecke, Sr.; Floyd Cox, Florafax International; James Ellison, for the Society of American Florists, and Todd Bachman, Bachman's, Inc.

Benefactors

A&W Glads, Inc.
Estate of Paul F. & Alwina Amling
Oscar G. Carlstedt Co.
Century Florist Supply Co.
John Henry Dudley
Kennicott Brothers Co.
Zelienople Greenhouses

On hand to receive Endowment recognition plaques for the Benefactor level of giving during the annual meeting luncheon, Westin Hotel, Chicago, were (l-r): Charles Walton, for Smithers-Oasis and Harrison (Red) Kennicott III, for Kennicott Brothers Co.

Patrons

Delaware Valley Wholesale Florist
Walter J. Engel, Inc.
Fred C. Flipse
Flower View Gardens
Four Farmers, Inc.
Pete Garcia Co.
Bob Gilmore Company, Inc.
Robert R. Hall, Inc.
The John Henry Co.
E.G. Hill Co.
Irwin Greenhouses, Inc.
McGinley Mills, Inc.
Mt. Eden Nursery
Northwest Florists' Assn.

On hand to receive Endowment recognition plaques for the Patron level of giving during the annual meeting luncheon, Westin Hotel, Chicago, were (l-r): Brenda Garcia, Pete Garcia Co. and Lorenzo de la Torre, Four Farmers, Inc.

Founders

American Oak Preserving Co.
Armellini Express Lines, Inc.
Bay State Florist Supply
Gordon Boswell Flowers, Inc.
CCC Associates Co.
CFX, Inc.
R.J. Carbone Co.
Everett Lawson Conklin
Creative Distributors, Inc.
Robert C. Dewey
The Exotic Gardens, Inc.
Frazee Flowers, Inc.
Greenleaf Wholesale Florists, Inc.
Hall Affiliates
The John Henry Co. Salesmen
William A. Maas
Park Floral Co.
Paul's Wholesale Florist
L. Piazza Wholesale Florists
A.N. Pierson, Inc.
A.L. Randall Co. Salesmen
Jack W. Redditt
Ribbon Narrow Fabric Co., Inc.
San Diego County Flower Assn.
Claymore C. Sieck
Sluder Floral Co.
Southern California Floral Assn.
Strange's Florist, Greenhouses and Garden Center
Stuppy Family Foundation
Sunnyside Nurseries, Inc.
Larry Teitel
John L. Tomasovic, Sr. Florist, Inc.
Jerome Wagner
Weatherford Farms & Greenhouses
Milton M. Weiss
Wholesale Florists and Florist Suppliers of America
N. H. Wright, Inc.

On hand to receive Endowment recognition plaques for the Founder level of giving during the annual meeting luncheon, Westin Hotel, Chicago, were (l-r): Bill Gouldin, Strange's Florist, Greenhouse and Garden Center; William A. Maas for William A. Maas; Clay Sieck, Claymore C. Sieck; Lindley Mann receiving for A.N. Pierson, Inc.; Chip Wright, N.H. Wright, Inc.; and Felix Ankele, Gordon Boswell Flowers, Inc.

Protectors

Robert C. Abrams
M. Adler's Son, Inc.
American Carnation Society
Amlings of California, Inc.
Associated Cut Flower Co., Inc.
Badger Wholesale
Ball Pan AM Plant Co.
Bay City Flower Co.
Larry Beck
Behnke Nurseries Co.
G.A. Berlin, Inc.
I.W. Bianchi, Inc.
Boesen The Florist
California Chrysanthemum Growers Assn.
Chicago Florist Supply Company
Clackamas Greenhouse, Inc.
Cleveland Plant & Flower Co.
Conner Park Florist, Inc.
Conroy's Inc.
Conroy Wholesale Florist
Continental Farms
Dillon Floral Corporation
John E. Dramm
Euser's Greenhouses, Inc.
FTD District 2-A&B
FTD District 6-A&B
Fairytale Foils
Fall River Florist Supply Co., Inc.
Floral & Nursery Times
Floralife, Inc.
Florists' Mutual Ins. Co. Officers
Flower News
Foco, Inc.
J.P. Freund, Inc.
Gallup & Stribling Orchids, Inc.
Pete Garcia Co. Sales Staff
Gelco Internacional, SA
Glad-A-Way Gardens
Fred C. Gloeckner & Co.
W.R. Grace & Co.
Groen Rose Co.
O. Ben Haley, Jr.
David E. Hartley
Hartman's Plants, Inc.
Mr. & Mrs. Donald Hook
Roy Houff & Co. Inc.
Robert E. Johnson
Wm. F. Kasting Co.
G.R. Kirk Co.
Ray Kitayama
Klepac Brothers Greenhouses, Inc.
Paul Krone Fellowship Fund
Lansing Florists Exchange
Lehrer's Flowers
Leider Horticultural Companies
Victor Levy
Lincoln Wholesale Florists, Inc.
Lynchburg Wholesale Floral Corp.
McShan Florist, Inc.
Malmborg's, Inc.
Matsui Nursery, Inc.
Mellano & Co.
Cloy M. Miller
Moore Paper Boxes, Inc.
Mount Clemens Rose Gardens
Mutual Cut Flower Co., Inc.
Nelson & Holmberg
Knud Nielsen Co., Inc.
Nor Cal Flower Growers
Norfolk Wholesale Floral Corp.
Nurserymen's Exchange
Oglesby Plant Laboratories
Oglevee Associates
Oliver & Thompson, Inc.
Oregon Roses, Inc.
Pajaro Valley Greenhouses, Inc.
Plant Marvel Laboratories
Rainbow Flowers, Inc.
Royer's Flowers, Inc.
Robert Saunders & Co.
Shinoda Floral Co.
Southern Floral Co.
Stimming Flowers
Sunshine State Carnations
Bill Suyeyasu Wholesale Florist, Inc.
Harry Tayama
Twin City Florist Supply, Inc.
United Wholesale Florists, Inc.
Vosters Nurseries, Inc.
Washington Bulb Co.
Mr. & Mrs. Otto P. Wentland
Olin Wetzel
Wilsey-Bennett Co./Floral Trans. Div.
William Zappettini Co.

On hand to receive Endowment recognition plaques for the Protector level of giving during the annual meeting luncheon, Westin Hotel, Chicago, were (l-r): Vince Adamo, Conner Park Florist; Tom DiCanio, Floral & Nursery Times; Paul Ecke, Jr., receiving for Mellano & Co.; Andy Siller, for Oregon Roses, Inc.; Ole Nissen, Sunshine State Carnations; Kenneth Lee, Rainbow Flowers, Inc.

Guardians

Jim Akin, Inc.
Aldik Artificial Flower Co.
Allied Florists Assn. of Baltimore
Allied Florists Assn. of Illinois
Ashland-Addison Florist
Baisch & Skinner, Inc.
Bartz Viviano Florists
Berwick Industries, Inc.
Z.D. Blackistone/Trust
John L. Bodette
Branch-Smith Publishing Co.
Brody Company
Buchbinder Bros.
California Florida Plant Co.
California Flower Market, Inc.
Callaham Wholesale Florists, Inc.
Candle Artisans, Inc.
Carson & Gebel Ribbon Co.
Burdette Coward & Co., Inc.
W.J. Cowee, Inc.
Dejong Greenhouse
Del Rey Plastics
Delhi Hills Flower & Garden Center, Inc.
Deloache, Inc.
Design Master, Inc.
Bill Doran Company
Dramm & Echter
Jim Durio Florist
Elisabeth Ecke
Austin S. Edgar, Inc.
Ellison's Greenhouses
Elmhurst Flower Growers, Inc.
Elmira Floral Products, Inc.
FTD District 3-A
FTD District 3-B
FTD District 3-G
FTD District 9-D
FTD District 10-A
Flint Florist Exchange
Floral Greens International
Floral Resources/Hawaii, Inc.
Florists' Publishing Co.
Gardens America, Inc.
Howard Gilliams
L. Ginsberg, Inc.
Glass Corner Greenhouse
Golden State Bulb Growers
Golden State Wholesale Florists
Green Leaf Enterprises, Inc.
The Green Thumb, Inc.
A. Gude Sons Company
The Haeger Foundation
Albin Hagstrom & Son, Inc.
Halifax Floral Co.
Mr. & Mrs. John Hanford
Hawaiian Heart, Inc.
Irene Hayes, Wadley & Smythe
Joseph H. Hill Co.
Huddart Floral
IF Supply Company, Inc.
Illinois State Florist Assn.
Edward Jacobson, Inc.
Johnston Investments
Ronald Jones Ferneries
Jones The Florist
Karthauser & Sons, Inc.
Jack B. Kaufman
Keeline-Wilcox Nurseries, Inc.
Keller Pottery Co.
Philip Lavalle
Lemac Nurseries
Norma A. Lineberger
Lion Ribbon Co.
Longview Fibre Co.
Lubbock Wholesale Florists
Mainland Nursery, Inc.
M.J. Malloy Co.
Jack Mayesh Wholesale Florist
Michigan Floral Assn.
Mischler's Florist
Missouri State Florists' Assn.
A.D. Mohr Greenhouses, Inc.
Grace L. Moore
Mueller Brothers, Inc.
NPI
Nordlie, Inc.
North Central Florists Assn.
Nyren Brothers, Inc.
J.B. Parks Wholesale Florist, Inc.
Pennsylvania Florist Assn.
S. Arthur Peterson
Pikes Peak Greenhouses
Pikes Peak Texas
A.B. Price, Inc.
Profile Glass Co.
Redbook Florist Services
Regency International Bus. Corp.
Rhyne Floral Supply Mfg. Co.
Riverdale Farms, Inc.
Rojahn and Malaney Co.
Sakata Seed America, Inc.
Schaefer Greenhouses, Inc.
Scott's Gladiolas Farms, Inc.
Harry A. Sharp
Shoch's Wholesale Florist
Leona Short
Southeastern Florist Assn.
Southern Rainbow Corp.
H.L. Stansell Trucking Co.
Sunbay, Inc. Wholesale Florists
Tagawa Greenhouses, Inc.
Tennessee Florist Supply
Hero Tsukushi
Tulsa Grnhse Inc. & Four State Whsle.
Twyford Plant Laboratories, Inc.
Uniflora Overseas Florida, Inc.
United Floral Exchange, Inc.
U.S. Floral Corp.
Veldkamp's Flowers
Alice Walker
White Bros. Rose Corp.
Renato J. Zappettini
Florence H. Zuegel

On hand to receive Endowment recognition plaques for the Guardian level of giving during the annual meeting luncheon, Westin Hotel, Chicago, were (l-r): Maureen Sneed for Conroy's, Inc.; Marcy Britigan, Buchbinder Brothers; Butch Coward, Burdette Coward & Co.; Eiichi Yoshida receiving for California Flower Market; Frank Mischler, Mischler's Florist; Jim Durio, Jim Durio Florist; Charles Kremp III for the Pennsylvania Florists Association; Fred Swindle, Redbook Florist Services; Sten Crissey receiving for Harry Sharp; Billy Zappettini for Reno Zappettini.

Vanguards

800-FLOWERS
Milton Adler Co.
Agrexco (USA) Ltd.
Ahern's, Inc.
Aldershot of New Mexico, Inc.
Allcities Allstates Flowers-By-Tele-Phone
Ameri-Cal Floral
American Florist Exchange
American Foliage Co.
Austin W. Amery
Amling Brothers
Amlings Flowerland
Anchor Hocking
Anchor Wholesale Flowers, Inc.
Apex-Neidinger, Inc.
Sam Applebaum
Aromas Nursery, Inc.
Assn. Florida Gladiolus Growers, Inc.
Mr. & Mrs. Lloyd Bachman
Baldwin Wholesale Florist, Inc.
G. Victor Ball
Ballard Blossom Shop
Barco Sons, Inc.
Charles Barr Co.
The Beall Company
A.G. Beiser Wholesale Floral Co.
Robert J. Bennett Wholesale Florist, Inc.
Berthold-Grigsby, Inc.
Mr. & Mrs. Newt Beugen
Biaggi's Evergreen Co.
Billings Floral
Blue Sky Flower Farms, Inc.
Boulevard Florist
Monica Bramblett
Bright's Florist Supply, Inc.
Bronx Florist Supply Co., Inc.
G.R. Brown Co.
Brown Floral Co.
K.C. Browne, Inc.
H.M. Buckley & Sons, Inc.
Buning The Florist
California First Bank
California Flower Farms, Inc.
California Flower Shippers, Inc.
California Pajarosa
Calvert Wholesale Florists, Inc.
Carlton Rose Nurseries
Henry M. Cathey
A. Cavallaro & Son, Inc.
Cedar Rapids Greenhouses
Chicago Flower Exchange
Chipola Nurseries, Inc.
Condor Farms
Conklyn's, Inc.
Continental Floral Greens
Coy Kendall Greenhouses
Cremer Florist, Inc.
Crestline Flower Shop
Crissey Flowers & Gifts
Crowley Brothers, Inc.
Daisy Hill Greenhouses, Inc.
Dakota Plastics
Davidson-Uphoff, Inc.
Dean's Designs, Inc.
DeSantis Florist
Devor Nurseries, Inc.
Didier Greenhouses, Inc.
Dos Pueblos Orchid Company
Carl Dreisbach, Inc.
J.W. Dudley Sons Co.
Thomas Dean Dudley
Paul Ecke III
Edward's Florist Supply, Inc.
Elliott Rose Co. of Madbury, Inc.
Elliott & Williams Roses
Ellis Floral Co., Inc.
Erie Cut Flower & Supply Co., Inc.
Esprit-Miami
FTD District 1-G&H
FTD District 5-A&B
FTD District 6-E
FTD District 6-F&G
FTD District 7-D
FTD District 8-F
FTD District 9-E
FTD District 14-B
Fenton Art Glass Co.
Ferris Brothers, Inc.
Louis Figone Nursery
Fiksdal's Flowers
Flambeau Products Corp.
Raymond A. Fleck, Inc.
Wade Fleming, Inc.
Floral Acres, Inc.
Florida State Florists' Assn.
Florimex, Inc. New York
Flower Trading Corp.
Don Flowers Florist, Inc.
Flowers By Sandy, Inc.
Foliage Co. Of America
Frampton's Greenhouses
Franklin China Co., Inc.
Frank Fredenhagen
Friesell Ranches
Garden City Floral
Geneva Flower Farm
George's Florist
Ghilarducci's Florists, Inc.
Giftwares Company, Inc.
Gish Flowers
Louis B. Glick & Son, Inc.
Golden West Greenhouse
Gordon's Grnhse., Inc. of Bear Valley
Joan S. Gordon
Robert L. Graham
Grande Greenhouse
Greenpoint Nurseries
Greenwood Greenhouses
Gregoire's Flowers
Growers Wholesale Florist
Handy Floral Products
Hanford's, Inc. Wholesale
Hardin's Wholesale Florist
Hauge's Flower Store, Inc.
Hausermann Orchids
Hawkins Greenhouses
Hayman & Lindenberg, Inc.
Herman J. Heyl Florists, Inc.
Heyl Roses, Inc.
Hillcrest Garden
Hirt's Wholesale Co.
Hub Floral Corp.
IBG International
Illinois Bronze Paint Co.
INARCO
International Floral Corp.
Jacksonville Whlse. Floral Co.
Jacobsens Flowers
Jednak Floral Co.
Jetram Sales, Inc.
Jiffy Foam, Inc.
J.R. Johnson Supply, Inc.
Johnston & McCallum, Inc.
David L. Jones Whlse. Florist/ Burnaby, BC, Canada
David L. Jones Whlse. Florist/ Spokane
Henry J. Kaufman & Assoc., Inc.
Kessler & Assoc.
Keystone Ribbon Co.
King Wholesale
Kitayama Brothers Greenhouse, Union City, CA
Kitayama Brothers Greenhouse, Brighton, CO
Kitayama Brothers Greenhouse, Watsonville, CA
Klenke Floral
Klupenger Nursery & Greenhouse, Inc.
Frank Kuwahara
Lakeland Florist Supply, Inc.
Lakewood Greenhouse, Inc.
Lamborn Floral Co.
Layser's Flowers, Inc.
Lee Wholesale Floral, Inc.
Ed Lenz Enterprises, Inc.
Lloyd's Wholesale Florist
Ludy Greenhouse Mfg. Corp.
M & M Wholesale Florist, Inc.
W.W. McAllister Co.
H. Hunter McIntire
Rod McLellan Co.
Robert Mann Packaging Co.
Alex R. Masson, Inc.
Andy Mast Greenhouses
Neal Mast & Sons Greenhouses, Inc.
Mazzoni Farms, Inc.
Bob Mears Wholesale Florist
Meldrum Mfg. & Engineering
Ruth Messmer - Florist, Inc.
Alice Metcalf
Middle Atlantic Florists Assn.
Harry Miller Flowers
Miller's Wholesale Florists
Minshall The Florist, Inc.
Molbak's Greenhouse, Inc.
Monterey Flowers, Inc.
Mountaineer Greenhouses
H.R. Mueller Florist
Multiflora Import Co.
H. Nakano & Sons
Navlet's Florists
Nettie's Flower Garden, Inc.
Hannah Niday Florist, Inc.
Ninomiya Nursery Co.
Nouvette Trading, Ltd.
Novacek Greenhouses
Oelschig's Wholesale Nursery
Oklahoma State Florists Assn.
Olsons Greenhouses
Robert L. Orth, Inc.
Pacific Coast Evergreens
Parmenter Florist, Inc.
Penn Hill Farm

Phillip's Flowers & Gifts
William Pinchbeck, Inc.
Platz Flowers & Supply
Mr. & Mrs. Gustav C. Poesch
Poulsen Greenhouses, Inc.
Premium Flowers Corp.
Harvey O. Preuss Florists
Quality Gladiolus Gardens, Inc.
Reeves Greenhouse, Inc.
Regional Farms, Inc.
Reliable Glassware & Pottery Co., Inc.
Curtis W. Richardson, Inc.
Steve Summers
Hans Rosacker Co.
Ross Marketing
Royal Gorge Flower Farms, Inc.
S & S Wholesale Florist
San Lorenzo of Texas
Betty Sapp
Satow Growers, Inc.
Mr. & Mrs. Israel Schneider
Mr. & Mrs. Robert O. Schurke
Seagroatt Companies
Select Ribbons, Inc.
Delois C. Shelton
Shenandoah Floral Mfg. Co., Inc.
Delbert Smith, Inc.
So. Calif. Flower Growers Assn.
Southern Steel & Wire, Inc.
Speight Associates Ltd.
Stimming Flowers of California
Stringer Whsle. Florist, Inc.
Susan's Florist
Syracuse Pottery, Inc.
Tayama Whlse. Florists
Taylor's Flower Shop & Greenhouse
The Taylors of Penny Hill
Tennessee Florist Supply, Inc.
Texas State Florists' Assn.
Thompson Rose Sales, Inc.
Transamerica Floral Imports
Ulery Greenhouse Co.
United Floral Supply, Inc.
United Whlse. Florists of California
U.S. Flowers
Vanni Nursery, Inc.
Joseph W. Vestal & Son Co., Inc.
Victor The Florist
Vinson & Fortiner
Vogt's Flowers, Inc.
Wadsworth Control Systems, Inc.
Curtis Wagner Co., Inc.
Wagner Greenhouses, Inc.
P.A. Washburn
Waterdale, Inc.
Weidner's Begonia Gardens
Welch Whlse. Florist, Inc.
West Side Greenhouses
Weston Trucking Co.
Weyerhauser Tissue Culture Center
Bruce Wheeler
Virginia Wienhoeber
J.F. Wilcox
Windler Whsle. Floral Co.
Everett Wright
G. Ramsey Yoder
Zeidler Floral Co.
Zieger & Sons, Inc.
Zipperer Farms

Sentinels

Agriflora Corporation
Ah Sam Floral Co.
Air Conditioned Roses
Allied Florists of Delaware Valley
Allied Flst. Assn. of VA
Allied Flsts. Assn. of Greater Wash.
Allied Flsts. Assn. of Worcester County
American Clay Works & Supply Co.
American Floral Art School
Amling Co.
Clarence Amling Roses, Inc.
Andre Greenhouses, Inc.
Augusta Wholesale Florist
B & K Tool Die Stamping Co., Inc.
Harold L. Bachman
Stanley Bachman
Maud Baker Flower Shop
Mr. & Mrs. John Balistreri
Banner Flower Shop
Barter Brothers Florist
John P. Bartlett
Henry Bass Greenhouses
Bel-Air Flower Growers & Shippers, Inc.
Bell Greenhouses, Inc.
Bens Transworld-Imp.
H.G. Berning
Hubert J. Beudert
Blackwell Nurseries, Inc.
Blue Pacific Flowers
Boone Greenhouses, Inc.
Bordine's Better Blooms
Mr. & Mrs. Ray Bozeman
Louis J. Brand
Frederick Brasco Florist
Brautigam Florist
Brookview Floral, Inc.
Buckingham Florist, Inc.
Busch Greenhouses, Inc.
Mr. & Mrs. Len Busch
Callaway Florists & Greenhouses
Callison's, Inc.
Canton Wholesale Floral, Inc.
Carey's Flowers, Inc.
Carolina Wholesale Florist
Carpenter's Flower Shop
T.S. Chan Nursery, Inc.
Charlotte Florist Supply Co.
Chase Gardens
G.C. Chastain Co., Inc.
Frank Clesen & Sons, Inc.
Colman Florist, Inc.
Colonialware Wholesale, Inc.
Colorado Floral Products
Colorado Springs Wholesale Florist, Inc.
Columbia Florist Club
Connell's Bexley Greenhouse
Continental Flowers
P.S. Cook
Cosmar Air Freight Service
Costa Nursery Farms
John W. Cox Wholesale Florist
Cronin Florist Shop
Crown Import Corp.
Cut Flower Exchange Of Pennsylvania
D & C Wholesale Florist, Inc.
Dalton's Flowers
Danielson Floral Co.
Dautoff Flower Growers
Delaware County Wholesale Florist
Detroit Flower Growers, Inc.
Dey Brothers Greenhouses
Dietert Wholesale Florist
Doherty Flowers
Lynn Doyle Flowers
Durban Greenhouses, Inc.
Ralph Durst Rose Gardens
Dusty's Flowers & Gifts
Dutch Brothers
DWF of Dallas
DWF of Norfolk
DWF of St. Louis
DWF of Salt Lake City
DWF of Tacoma
Eastern Floral Exchange
Echter's Greenhouses, Inc.
Edward's Florist
Elliott Greenhouses
Endres Floral Co.
Ensign Wholesale Florist, Inc.
Equiflor Corporation
Express Seed Co.
FTD District 3-H
FTD District 6-C&D
FTD District 8-A
FTD District 9-B
FTD District 11-E
FTD District 13-B
FTD District 13-C
FTD District 13-D
FTD District 13-G
Fayette Wholesale Flst., Inc.
Felly's Flowers
Henry W. Fischer & Son
Fischer's Flowers
Fisher Florist
Floral Ave. Greenhouse Co.
Floral Supply, Inc.
Flot Aire, Inc.
Flowers by Esther
Flowers From Florida
Flowers Tommy Luke
Flowers, Inc. Wholesale
Forest Grove Ferneries
Foxpoint Plant Growers
Fraser's Flowers
Fredlo Farms
Harry H. Fukutome Nursery, Inc.
Galloway Florist, Inc.
Garcia Group
Gardenville Greenhouses
Gardner's Westwood Flower Shop
The Garland Company
Garner Farms, Inc.
Jerry Geary Flowers
Genna's Wholesale Flowers

George M. Geralis
Gerhart Greenhouses
Germantown Greenhouses, Inc.
Global Flower Corp.
Golden Gate Flower Growers
Gongaware & Parry Florist
Carl F. & Jean Gortzig
Graham Wholesale Floral, Inc.
Grayce Floral Supplies, Inc.
Greater St. Louis Flower Growers Assn.
Green Circle Growers, Inc.
Growing Systems, Inc.
Don Hahlbeck Greenhouse
Hall's Flower Shop
Halsema Greenhouses
Harmar Products, Inc.
Harrison Wholesale Floral
Harrison Flowers
Hartford Florist Supply
Hastings, Inc.
Heap Greenhouses, Inc.
Heeney Company, Inc.
Henry's Plant Farm
Hermes Floral Company
Hertog Floral Co.
Hiawatha, Inc.
A.B. Hill
Simon Hoekstra and Son
Huhn's Greenhouse
Illiana Unit of Teleflora
International Flower Exchange
Ivandale Floral Co.
Ivy Acres, Inc.
J & E Wholesale Floral Co.
Earle A. Johnson Florist
Johnson Floral Co.
Johnson Greenhouses, Inc.
Johnson's Roses, Inc.
T. Larry Jones, Inc.
Robert Jones' Mt. Madonna Orchids
Kannapolis Wholesale Florist
Kansas State Florists Assn.
Kariya Nursery
Kato Cut Flower
Kearney Floral Co.
Kel-Stan Products Co.
Kervan Co., Inc.
Norm Kesel Florist, Inc.
Mrs. Leland T. Kintzele
Mark Knox Flowers
George Koch Sons, Inc.
Kodama Sunnydale Greenhouse
Koehler & Dramm, Inc.
Charles F. Kremp III Florist
Lafayette Florist & Greenhouses, Inc.
Lake Washington Greenhouses
Lanman Flower Shop, Inc.
Lebens Flowers, Inc.
Herman Lederer Sons
Merlin Leger
Lewis Brothers, Inc.
Lindskoog Florist
Lomey Manufacturing Corp.
Lynde Greenhouses, Inc.
W.W. McAllister Co.
J.M. McConkey & Co., Inc.
McLeod Florist
McNamara – Broadripple Florist
Maekawa Brothers Greenhouses, Inc.
Magicsilk Div. of Selo, Inc.
Marche & Co.
Joseph Markow Florist
Marshall St. Greenhouses
Mary Jane Florist/Gift Shop
Mattern Floral, Inc.
Mattoon Flower Shop & Greenhouses
Meadows Brothers Nursery Equipment
Herman Meinders
Joseph S. Merritt, Jr.
Donald Metzger
Edwin Michel, Inc.
Henry F. Michell Co.
Kei Mikuriya
Miller Floral Co.
Don Miller Greenhouse Co.
Paul Minor, Inc.
Mobile Wholesale Floral Co.
Erwin Mojonnier Enterprises
Montana State Florist Assn.
Moore's Wholesale Florists
John R. Moore Greens Co., Inc.
Mosmiller Florist
Mountain View Wholesale Florist, Inc.
Muennich Sales, Inc.
A. Nagamine Nursery, Inc.
K. Nakashima Nursery Co.
Nanz & Kraft Florist
National Greenhouse Co.
Neilson Orchids
Ness Flowers
Neubauers Flowers, Inc.
Newton Greenhouse
Niedens Hillside Floral, Inc.
Nishimoto Nursery
Novelties By Premier Ltd.
G. Nutile, Inc.
Oak Grove Fernery
Oakland Flower Shop, Inc.
The Oklahoma Flower Market
Orlander Florist, Inc.
Herman Orth Corp.
Stephen Otte
Michael Parrella
S. Arthur Peterson, Inc.
Phoenix Flower Shops
Pickrells Florist, Inc.
Pickrells Wholesale Flowers & Supplies
Pietrafeso Greenhouses
Poets of WF&FSA
Pressells Flowers
S. Russell Prizer Florist
Quality Wholesale Florist
Reeds Flowers
Henry T. Ritter
Clarence Roberts
Rockville Florist
Rockwell Farms, Inc.
Rocky Mountain Wholesale Florists, Inc.
Dick Rosacker
Rosedale Greenhouses, Inc.
Rosemont Gardens
Rough Brothers, Inc.
Rubens Originals
St. Louis Wholesale Plant Co.
Schaaf Floral And Gift
Schlag's Gladiolus Farms
Sedan Floral, Inc.
Selecta Farms, Inc.
John D. Shanklin
Willis Shaw
Sheppard Enterprises, Inc.
Shreveport Flower Mart, Inc.
Sieck Wholesale Florist, Inc.
Earl J. Small Growers, Inc.
Ray Smith Cut Flowers
Smith's Flower Shop
Society of Iowa Florists
South Louisiana Co-op, Inc.
Specialty Wood Products
Springfield Florists Supply
Spurlock's Flowers
Stonehurst Wholesale Florists
Stonequarry Greenhouses, Inc.
Mr. & Mrs. Leo Stuhldreher
Suburban Wholesale Florist
Daniel Sugrue and Sons
Sun Valley Bulb Farms, Inc.
Superior Florals, Inc.
Swanson the Florist, Inc.
T and W Sales Co.
Tennessee Wholesale Florists
George Thomas, Inc.
J.H. Thompson, Inc.
Thornton Wholesale Florists
Tietze Wholesale Florist
Tipton & Hurst, Inc.
Tobler's Flowers, Inc.
Todd's Flowers
Tommy's Wholesale Florist, Inc.
Topstar Floral, Inc.
Tri City Florist Supply
Tropic Greenhouses
Tropical Foliage Plants, Inc.
Tulsa Flower Exchange, Inc.
Two-E Carnations, Inc.
Union County Florist Supply, Inc.
Uto's Greenhouse, Inc.
Vacuum Orna-Metal, Inc.
Van Dyk Brothers
Van Zanten's, Inc.
Vestal Wholesale Florist, Inc.
Viva's Flowers
Wald Imports Ltd.
Clinton A. Wallace
Virginia R. Walter
The Wamego Floral Co.
West Texas Floral Co., Inc.
Ray Western
White's Nursery & Greenhouses
Wilch, Smith & Brock
Wild Flowers Quality Wholesale Florist, Inc.
Harold Wilkins
Wilmington Florists Exchange, Inc.
Winandy Greenhouse Construction Co.
Norman H. Winter, Inc.
Witmer's Greenhouses, Inc.
W.M. Woodruff's Son, Inc.
World Flowers, Inc.
XYZ Imports, Inc.
York Florist
Yoshida Farms, Inc.
Youngstown Plant & Flower
Zimlich The Florist, Inc.

Sponsors

Allen Associates, Inc.
A-Roo Company
Associated Florist Supplies, Inc.
Atkin Florist
Baack's, Inc.
C.J. Baker Wholesale Florists
Baumgarten-Krueger
David W. Bianchi
Binley Florist, Inc.
Milt Bley
Blue Ribbon Carnations, Inc.
Bonnett Wholesale Florist, Inc.
Breitinger's Flowers, Inc.
Jack Buckley & Associates
Buffalo Import Co.
Candle-lite
Cedar Bridge Nurseries
Central Iowa Wholesale Floral, Inc.
Norm Cha Lor Flowers, Inc.
D.S. Cole Growers
Colonial House of Flowers
Cottage Flowers
Cottage Gardens Nursery, Inc.
Craftex Wholesale Distributors
Creative Marketing Concepts, Inc.
Crown Floral
D&W Greenhouses
Kay Danzer Co.
Eugene R. Daudlin, Inc.
Gene M. Dodson and Associates
East Coast Bulb Farm
Eastern Floral and Gift Shop
Elfrieda's Flowers, Inc.
Elzerman's Greenhouse
Entenmann's Florists
Cindy Essers Floral Shop
Everflora, Inc.
Everflora Chicago, Inc.
Barry Falkenberg
Fantom & Gahs Greenhouses, Inc.
Robert Fine Associates
Fleu De Lis Wholesale Florist Supply
Floralware By E P M
Florists Review
Flowers By Ford
Flowers First, Inc.
Flowerwood
Forget-Me-Not Florists
Four Seasons Roses
French's Cut Flowers
Gainan's Flowers
Gassafy Wholesale Florist
Givnish Floral Imports
Glenn's Wholesale Florist, Inc.
Green Mountain Florist Supply
Green Valley Floral
Greenbrook Flowers, Inc.
Hibco Plastics, Inc.
Hoak's Greenhouse & Nursery
Holm & Olson, Inc.
Hoo's Florist & Plant Shop
Hopper's Wholesale Florist
Horizon Farms, Inc.
Hrnak's Flowerland, Inc.
Hungerford Farms, Inc.
Jean's Flower Shop
Johnston The Florist
KPT Wholesale Florist
Knaup Floral Co.
Kocher Plant & Soil Lab
Kono & Sons, Inc.
Lala Imports, Inc.
Lopshire Flowers
Dave Lowenheim & Associates
Lynbrook Wholesale Florist Supply
Robert E. Lyons
McCallum Wholesale Floral Services, Inc.
Mac Lennan's Flowers, Inc.
Maday Wholesale Greenhouses, Inc.
Mafco Imports Ltd.
Richard Malvern Florist
Mason Glassware Co.
Massoni Wholesale, Inc.
Matzke Florists
Mid Island Floral Supply Ltd.
Minneapolis Floral Co.
Miyashita Nursery
Mosser Lee Co.
Mountain View Florist, Inc.
John Mundy Florist
The Murphy Co.
Nabeta Nursery, Inc.
E.J. Nagengast Florist & Greenhouse
Newports Flowers, Inc.
Nickeson Greenhouses
Oishi Nursery
Ozark Wholesale Florist, Inc.
PBA Orchid Isle Nursery
Pacific Flowers In Encinitas
Packaging By Gusty F. Choles
Palisade Greenhouse, Inc.
Panacea Products Corporation
Paradise Candles, Inc.
Partyline Florist
Pennsylvania Cut Flower Co.
Charles Perkins & Associates
Mrs. Edythe B. Pfahl
Ed and Rose Phillips
Phoebe Floral Shop
Pletschers Greenhouses, Inc.
Pontiac Greenhouses
Priola Greenhouses, Inc.
Quinlan Wholesale Florist, Inc.
RJS Greenhouses
George W. Radebaugh & Sons
Rancho Del Mar Wholesale
Relles Florist
A. Repetto Nursery
Riverside Wholesale Florist
Roderick Wholesale Florists
Rod Saline
Salinas Wholesale Florists, Inc.
San Diego Florist Supplies
James Saunoris & Sons, Inc.
Savon Wholesale Florist Supply
Jim Selby
Shady Hill Gardens
South-Western Floral, Inc.
Southern Cut Wholesale Flowers
Speers Flower Shop
Spokane Flower Growers, Inc.
Stadium Flowers
Stafford Conservatories, Inc.
Sun Pacific Flower Shippers
Sunwest Wholesale Floral
Trenton Crockery Co.
Val-Al Greenhouses, Inc.
Valley Wholesale Floral of Lincoln
Vase D'Lite
Vissers Florist & Greenhouse
Viviano Flower Shop
Watsonville Nurseries
Weinstocks Flowers
Wilhide's Flowers
I.V. Wilson Florist

Givers

Mark P. Bridgen
Brouwer Nursery
Central Michigan Wholesale
Connecticut Florists Assn., Inc.
Kenneth L. Goldsberry
Jeffrey B. Jones
John W. Kelly
David Koranski
Marvin N. Miller
Mobile Florist
Mt. Vernon Florist, Inc.
Nuckton Co.
O K Papers, Inc.
Mr. & Mrs. Conrad J. Olson
Paul's Unique Creations
H. Brent Pemberton
Mr. & Mrs. Leslie Pilgrim
James F. Price
Rheba's House Of Flowers
Mrs. Fritz F. Roll, Jr.
Rosenfeld Ribbon, Inc.
John G. Seeley

Contributors Through FTD Clearing House

A Little Something
A Sweet Touch Florist
Acacia Flower Shop, Inc.
Accent Florist
Adam's Florists, Inc.
E.R. Adgate & Son Florist
Aiea Florist
Albert's Flowers & Greenhouse
Aldrich Floral Studio
Aloha Florist
Altman's Flower & Gift Box
Altus Floral Co.
Ann's Florist & Greenhouse
Annandale Florist & Nursery
Anthony's Florist & Gifts
Arlene's Flowers
Art Floral
Audrey's Flower Shop, Inc.
Aurora Village Florist
BO-TY Florist, Inc.
Backmann Florist
Balch's Flowers
Ball-Park Floral
Barbara's Blossom Shop, Inc.
Barth's Florists
Beatty & Sons Florist
Becks East Peoria Florist
Bird's Nest Florist
Blair's Florist Shoppe
Blossom Shop Florist, TN
Blossom Shop Florist, TX
Bortmas the Butler Florist
Bos Floral, Inc.
Boulevard Florist & Greenhouse
Bouquet Boutique Flowers
Bouquet Boutique, Inc.
Boyntons Greenhouse
Brandywine Flower, Inc.
Brenham Floral Co.
Broadmoor Florist
Brown's Flowers
F.C. Bruns & Sons
Buckingham Florist, Inc.
Buds 'n Bees
Buell Florist & Greenhouse
Burgevin Florist
Burn's Flower Shop
Burns Floral Co. & Greenhouse
Busse & Rieck Sunnyside Greenhouse
Butterfield's Hyatt Regency
Cable Car Florist
Casa Trias Florist
Cason's Flowers & Gifts
Charles The Florist
Chars Flowers, Inc.
Chester's Flower Shop & Greenhouse
Christell's Flower, Inc.
Christensen the Florist
Christoffers Custom Flowers
Chula Vista Florist Co.
Cinderella Flower Shop
City Floral Shop
Clair's Flower Shop, Inc.
Clark Street Florists, Inc.
Clark's Flowers
Clarks San Luis Obispo
Claudia's Flowers
Clayton's Floral & Garden
Cleveland The Florist
Coalinga Floral
Colonial Florist, NH
Colonial Florist, NY
Colonial Flower Shop
Colonial House of Flowers, CA
Colonial House of Flowers, NJ
Conway Palms Florist
Marshall T. Cooke
Cottage Flowers, Inc.
Country Thickets, Ltd.
Coy Kendall Flowers, Inc.
Crevasse's, Inc.
Crouthamel Flower Shop
Crown Heights Florist
Cupertino Nursery & Florist
Cypress Gardens Flower Shop
Dahl's Floral Gardens
Dalsimer, Inc.
David's University Florist
Davis Florist
Shirley Dean's Flowers
Demmie Blackistone & Associates
Dicks Flowers, Inc.
Ralph Dillon's Flowers
Dodge the Florist, Inc.
Edelweiss Floral
Edmonds Flower Shop
Elaine's Flowers
Elizabeth's Flowers
Elizabethtown Florist
Elmwood Florist, Inc.
Emling Florist
Emma's Flowers & Gifts
Empire Florist
Erickson's, Inc.
Eubank Florist
Eve's Flowers, Inc.
Evelyn's Flowers
Everett Mall City Floral
Feeney Florist
Fellys, Inc.
Ferrari Florist Gifts
Festus Flower Shoppe
Fields Flower Shop
Floden's Florist
Floral Arts
Floral Creations, Inc.
Floral Images
Florist Atlanta
Floristically Yours Flowers
Flower Basket, CA
Flower Basket, MO
Flower Basket Greenhouses
Flower Bowl & Gift Shop
Flower Fair
Flower Lane Florists, Inc.
Flower Palace of Winter Haven
Flower Parlour
Flowerette
Flowerland
Flowerland Florist
Flowers Galore
Flowers and Gifts by Barbara
Flowers by Colette
Flowers by Dick Lee, Inc.
Flowers by Goz, Inc.
Flowers by Hansen
Flowers by Jean Ann
Flowers by Voyer, Inc.
Forte's Flower Patch
Foster's Flowers
Four Seasons Florist
Foushee Florist
Fran's Florist
Frances Flower Shop
William J. Franklin
Fred's Flowers and Gifts
Freeman's Florist, Inc.
Fussell Florist, Inc.
Gable's Florist & Greenhouse
Galeton Greenhouses
Gali's Flower & Garden Center
Garden City Florist
Garrison Hill Greenhouses
George's Flower Shop
Gig Morris Belmar Florist
Gilliam's Florist of Greensboro
Ginza Florist & Gift Shop
Girton's Flowers & Gifts
Glen Terrace Flower Shop
Glidden Campus Florist
Gordon's Flowers
Grassi's Flowers & Gifts
Gray's Floral Gallery, Ltd.
Green Bay Floral & Greenhouse
Green Leaf Florist
Greenspoint Florist
Greenwald's Greenhouses
Haberkamp's Flowers
Hall & Di Maria Flower Shop
Halliwells Florist
Hamill Floral
Hanna's Florist
Hansens Flower Shop, Inc.
Harold's Flowers
Harrisons' Flowers
Hart Floral
Hemmerly's Flowers & Gifts
Henderson's Flower Shop
Heritage Flowers
Hibbard's, Inc.
Hillside Florist
Hilltop Florist
Holmes-McDuffy Florist, Inc.
Harold Hoogasian Flowers
House of Flowers
House of Flowers Greenhouse
Hrnak's Flowerland, Inc.
Hunkele
Hutchinson's Flowers, Inc.
Ice House Flowers, Inc.
Inglis University Florist
Issaquah Floral & Gift Shop
Jan's Flower Affair
Emily Jaynes Flowers, Inc.
Jean's Flower & Gift Shop
Jenks Flower & Gifts
Jim's Flowers
Johnnie's Floral Shoppe
Johnson's Flower Center
Judd's Flowers & Plants
Jultak's Flowers
Karen's Flower Kottage
Kay's Floral Shoppe, Inc.
Kean Flowers
Keefe's Flowers, Inc.
Keil Brothers Greenhouses
Keller Florist

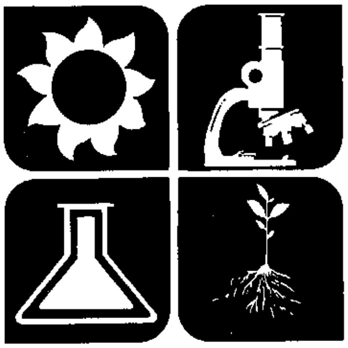
Ken's Flowers & Gifts
Ken-Mar Flowers
Clark Kennedy Florist
Norm Kesel Florist, Inc.
Kingston Floral
Kitty's Flowers
Lafleurs Flower & Gift Shop
Lee's Flower & Gift Shop
Robert A. Lehde Florist
Lenores Florist
Lesher's Flowers, Inc.
Lige Green Flowers & Gifts
Lilly's Flowers
Little Mountain Flowers
Log Cabin Florist
Lombard Floral Co.
Longmont Florist, Inc.
Lorbeer's Flower Shoppe
Lord's Flowers
Los Alamitos Florist
Lumberton Floral Co., Inc.
M'Lady's Flowers
Mableton Flower Shop
Main Street Florist, Inc.
Marble Falls Flower & Gift
Marie's Village Flowers
Markers University Florist
Marlowe's Flowers & Gifts
Mary Bell's Flowers
Mary Jane Flowers & Gifts
Mary Jane's Floral Basket
Matles Florist
McKinney's Flowers, Inc.
McLean Flower Affair
McLeod's Flowers
Memorial City Florist
Miami Floral
Michler Florist, Inc.
Midway Florist
Midwest City Flowers Shop
Millard Greenhouses
Miller's Florist
Minton's Flowers
H. Mormile & Sons
Mueller's Flower Shop
Murphy Florist & Gifts
Nature Nook Florist
Neponset Florist, Inc.
Newtown Square Flower Shop
H.J. Nielson Florist
North Liberty Flower Shop
Northside Floral
Norwalk Florist
Novak Flowers, Inc.
Bill O'Shea's Florist
Olde Village Flower Shop
Bob Olin's Flowers
Olympia Florist, Inc.
Original Anna Catanese
Osborne's Florist
Oscoda Floral
Our Creations Florist
Owens Flower Shop, Inc.
Parmentier's 9th St. Floral
Paul's Flower and Plant Shop
Paul's Flowers
Penfield Flower Shop, Inc.
Penny & Irene's Flowers
Perez & Co. Florist
Petal Florist
Petal Patch
Petal Pusher Florist
Peter's Flowers
Placerville Flower Shop
Plaza Flowers, AZ
Plaza Flowers, IL
Lee Polites - Florist
Pompton Lakes Florist
Posno Flowers
Prescott Flower Shop
Alan Preuss Florists, Inc.
Pugh's Floral Shop
Queen Anne Flowers & Gifts
Harry Quint Greenhouse
George W. Radebaugh & Sons
Raffensberger's Flower & Gift
Reed-Hills Florist
Richards-Rodgers Florists
Riedel's Flowers, Inc.
Riverside Florist & Gifts
Riverside Greenhouses, Inc.
Riverview Florist
Robbins Flowers
Rockcastle Florist
Rockville Florist
Rocky Ford Floral
E.L. Rocquin Florist & Grnhs.
Robert Rogers Florist
Rosaia Brothers Floral
Rose Glen Florist, Inc.
Rose's Florist, Inc.
Rosie's Florist & Gift Shop
Rothermel Flowers & Gifts
Harold A. Ryan, Inc.
Sam's Flower and Gift Shop
San Rafael Floral Company
Santa Rosa Flower Shop
Schmidt's Flowers
Scott Florist
Sea Tac Flowers
A.W. Seeley & Son
Seifert's Floral Co.
Shady Lawn Florist & Greenhouse
Silk's Flower Shop
Simi Valley Florist
Smith Floral Co.
Marion Smith Florist
Smith's Greenhouses, Inc.
Speedway Flower Shop
Spencer Florist & Garden Center
St. Cloud Floral, Inc.
Stanley's Flower Shop, Inc.
Stanleys Fl&Fr Baskets
State College Floral Shop
Steffy's Flowers
M.J. Steiner Flower Shop
Stember Fashions in Flowers
Sunnywoods Flower Shop
Swanson The Florist, Inc.
Swartley's Florist
Taylor Floral Co., Inc.
Tehachapi Flower Shop
Thatchers Florist & Gifts
The Blossom Shop
The Bouquet Shop
The Denville Plant Peddler
The Flower Box
The Flower Cart, Inc.
The Flower Mill
The Green Scene
The Little Greenhouse
The Loraine Gardens
The Mariemont Florist
The Norwich Flower Shop
The Petal Pusher Florist
The Posey Patch Florist
Joseph Thomas Flower Shop
Tommy Tucker Flower Shop
Tucker Flower Shop, Inc.
Tulip Tree Floral
University Flower Shop, Inc.
Valley Flowers
Valley Garden Center
Vidor Florist Shop
Village Florist
Village Flower & Gifts
Village Green
Vincent's Greenhouse
Virginia's Flowers
Walker's Florist
Tom Ward Florist
Wayside Gardens, Inc.
Wayside Nurseries
Henry Weiland Company
Weinstock's Florists, Inc.
Welke's House of Roses
West End Greenhouses
Westloop Floral
Wharton House of Flowers
Whidden Florist, Inc.
William-Edward Florists
Williams Flower Shop
Winfield Flower Shoppe
Winter Floral Co.
Wirth Florist
Woodbridge Shoppe
Woodinville Florist
World of Flowers
Yazel's Colonial Flowers
York Florist
Yuess Gardens Company
Zimmer Floral, Inc.

Endowment Club

The Endowment Club was established to recognize contributors of $10,000 or more, those who pledge to complete this amount within ten years through cash donations, provide a bequest in their will, or take out a $30,000 whole life insurance policy. Endowment Club members as of December 1989, follow:

A & W Glads, Inc.
Bob and Betty Abrams
American Floral Services, Inc.
American Florist Exchange
American Oak Preserving Co.
Armellini Express Lines, Inc.
Asocolflores
Associated Cut Flower Co., Inc.
Bachman's, Inc.
George J. Ball Co., Inc.
Bay State Florist Supply
Larry Beck
Behnke Nurseries Co.
Gordon Boswell Flowers, Inc.
Albert H. Burki Foundation
CCC Associates
CFX, Inc.
R.J. Carbone Company
Oscar G. Carlstedt Co.
Century Florist Supply Co.
Chicago Florist Supply Co.
The Claprood Companies
Cleveland Plant & Flower Co.
Colombia Flower Council
Conner Park Florist, Inc.
Conroy's, Inc.
Continental Farms
Creative Distributors, Inc.
Delaware Valley Wholesale Florist, Inc.
Robert C. Dewey
Dillon Floral Corp.
John Henry Dudley
DWF Wholesale Florists
Elisabeth Ecke
Paul Ecke Poinsettias
Paul Ecke, Sr.
Walter J. Engel, Inc.
Euser's Greenhouses, Inc.
The Exotic Gardens, Inc.
Fall River Florists Supply Co.
Fred C. Flipse
Florafax International, Inc.
Floralife, Inc.
Florists' Mutual Ins. Co.
Florists' Transworld Delivery Association
Flower News
Flower View Gardens
Four Farmers, Inc.
Frazee Flowers, Inc.
J.P. Freund, Inc.
Pete Garcia Company
Pete Garcia Co. Sales Staff
Gelco Internacional, SA
Bob Gilmore Company, Inc.
W.R. Grace & Co.
The Green Thumb, Inc.
Greenleaf Wholesale Florists, Inc.
Gude Brothers Co.
O. Ben Haley, Jr.
Hall Affiliates
Robert R. Hall, Inc.
David E. Hartley
The John Henry Company
The John Henry Co. Salesmen
Highland Supply Corp.
E.G. Hill Company
Don and Kay Hook
Roy Houff & Co., Inc.
Irwin Greenhouses, Inc.
Jacobsens Flowers
Wm. F. Kasting Co.
Kennicott Brothers Co.
Lansing Florists Exchange
Lehrer's Flowers
Leider Horticultural Companies
Lincoln Wholesale Florists, Inc.
William A. Maas
Mainland Nursery, Inc.
Malmborg's, Inc.
Manatee Fruit Company
Matsui Nursery, Inc.
McGinley Mills, Inc.
McShan Florist, Inc.
Mellano & Company
Mikkelsens, Incorporated
Mt. Eden Nursery Company
Mueller Brothers, Inc.
Nelson and Holmberg
Northwest Florists' Assn.
Nurserymen's Exchange
Oliver & Thompson, Inc.
Pajaro Valley Greenhouses, Inc.
Park Floral Co.
Paul's Wholesale Florists
Pennock Company
L. Piazza Wholesale Florists
A.N. Pierson, Inc.
Pittsburgh Cut Flower Co.
Plant Marvel Laboratories
A.L. Randall Company
A.L. Randall Co. Salesmen
Jack W. Redditt
Reeves Greenhouse, Inc.
Ribbon Narrow Fabric Co.
San Diego County Flower Assn.
Betty Sapp
Shinoda Floral Co.
Claymore C. Sieck
Sluder Floral Co.
Smithers-Oasis
Society of American Florists
So. California Floral Assn.
Speight Associates, Ltd.
Strange's Florist, Greenhouses and Garden Center
Stuppy Family Foundation
Sunburst Farms, Inc.
Sunnyside Nurseries, Inc.
Syndicate Sales, Inc.
Harry Tayama
Larry Teitel
Teleflora, Inc.
John L. Tomasovic Sr. Florist, Inc.
Twin City Florist Supply, Inc.
United Wholesale Florists, Inc.
Van's, Inc.
Jerome Wagner
Weatherford Farms and Greenhouses
Milton Weiss
Olin Wetzel
WFR, Inc.
Wholesale Florists and Florist Suppliers of America
Harold S. Wilkins
Wilsey-Bennett Co./Floral Trans. Div.
Wolfe the Florist, Inc.
N.H. Wright, Inc.
Yoder Brothers, Inc.
Zelienople Greenhouses

Projects and Grants



Total 1989 Grants $364,188

1989 Research Progress Reports

Dr. Marlin Rogers

Semi-annual progress reports are required on all Endowment funded research projects, with final reports to be submitted upon completion of the work. The purpose is to enable Trustees to stay abreast of the status of projects funded by the Endowment and to assure that objectives remain constant.

While the Endowment Board of Trustees makes final decisions, the SAF Research Committee has reviewed proposals and made recommendations to the Board for funding since 1978. To assist in this endeavor, the Endowment provides expenses for an advisor from the academic community. Dr. Marlin Rogers, University of Missouri, is the current advisor.

Please Note

Progress reports have been expanded for this annual report. However, recognizing that more indepth reports are of interest to some contributors, anyone wishing more information is encouraged to contact the project leaders directly. The names and addresses are provided at the end of each report.

Breeding

1. Biotechnological Breeding of Alstroemeria, University of Connecticut; Cornell University; The Pennsylvania State University.
$32,427 – 4th year

Objective:

The main objective of this project was to develop, within three years, new cultivars of *Alstroemeria* for the American flower growers and florists.

This was accomplished by:

- developing procedures for the biotechnological development of new *Alstroemeria* cultivars,
- selecting improved cultivars,
- conducting trials on selected plants, and
- releasing new cultivars to the florist industry.

Anticipated Benefits to the Floral Industry:

The benefits to the American Floral industry will include:

- The expeditious development of new *Alstroemeria* cultivars with improved floral characteristics for American growers,
- the elimination of high royalty payments, and
- increased *Alstroemeria* production in the United States.

Due to a lack of research on *Alstroemeria* in the past by American growers and breeders, the Dutch and others have forced us to pay high royalties on rhizome divisions and to pay high prices for cut flowers. This is very unfortunate for the American retail customer because *Alstroemeria* grown in the United States have much more attractive flowers than those grown in Europe; they are larger and more colorful and they have the potential for longer postharvest lives. A lack of germplasm as well as sterility in popular cultivars has made progress slow in traditional breeding; however, plant biotechnology allowed us to produce new *Alstroemeria* variants within three years through somaclonal variation, mutation breeding and embryo rescue. Procedures to accomplish these tasks on *Alstroemeria* have been outlined and are being refined.

Dr. Mark P. Bridgen

Progress:

In the spring of 1986, approximately 350 plants from treated seeds were taken to the Cornell greenhouses and planted. During that summer, 28 selections were made from this population. When these selections flowered in 1987, they were self pollinated and seeds collected during the summer. In the fall of 1987, the selections were divided into 3 divisions each and planted in a separate bench. The seeds from the pollinations were sown at UConn during that winter and seed viability was assessed. During the spring of 1988, all collaborators in this project met at Cornell during peak flower production to evaluate the selections. At that time, 5 main selections were made and a crossing plan was designed with these plants.

We have named the first 5 selections from our work 'The Endowment Series'. These plants are in the process of being patented; once patented and licensed to growers, royalties will be provided to the Endowment. Data on their flower production, height, the length of flowering period and other characteristics will continue to be compared.

Several subjective observations concerning 'The Endowment Series' have been made. They produce less vegetative shoots once flowering is initiated; this saves tremendous time in thinning and may also decrease the number of blind shoots produced. The plants have strong stems, which not only aid in collecting the flowers, but will also help with post harvest care. The inflorescences are shorter than the Dutch varieties; they are not dwarf, but they are short enough that the flowers only need minimal support. Many of the Dutch cultivars are so tall that they bend as they grow and often fall over into the walkways; this decreases flower production. 'The Endowment Series' are tall enough to produce marketable flowers, but short enough to avoid these problems.

In vitro techniques for the propagation and genetic improvement of *Alstroemeria* have also been determined as a result of this project. Micropropagation is essential for Inca Lilies if they are to be commercially produced. Studies of the disinfestation of rhizomes, shoot proliferation and *in vitro* rooting have been successfully accomplished. The development of these techniques will allow the rapid multiplication and dissemination of new cultivars.

Embryo rescue procedures to aseptically remove an embryo from a developing seed and to culture it on a nutrient medium have also been determined. This procedure was utilized with *Alstroemeria* to rescue hybrids between normally incompatible species. The first successful cross with the fragrant species *A. caryophylla* was accomplished in our laboratory due to embryo rescue. We had tried for three years to make this cross with traditional breeding procedures and all attempts failed. The plants are now growing in the greenhouse and are ready to flower and to be evaluated. If fragrance was transmitted by the species *A. caryophylla*, these plants may be the most valuable *Alstroemeria* in existence.

Seed germination procedures were worked out in detail during this project. We found that most seeds need four weeks of moist warmth followed by four weeks of moist cold to germinate. We also found that this varies with the cultivars used as well as the age of the seeds.

Plant expeditions to Chile in January, 1988, and November, 1989, and to Brazil in September, 1987 have allowed us to build up one of the largest collections of *Alstroemeria* species in the world. These will be used for further breeding projects. They include: *A. caryophylla, A. sierrae, A. aurea, A. revoluta, A. chiliensis, A. kingii, A. philippi, A. shizanthoides, A. magenta, A. gayana, A. pelegrina, A. diluta chrysantha, A. crispata, A. hookeri maculata, A. hookeri hookeri, A. pulchra,* and several other unidentified species.

As a result of this project, information on somatic embryogenesis, medium cooling, plant nutrition, somaclonal variation, and plant growth regulators have also been determined. In addition, several excellent floriculturists have been trained including Joe King, Paul Winski, Mark Smith, and Ramona Reiser. They all have either received or will receive a Master's degree as a result of this project.

Dr. Mark P. Bridgen, Project Leader
University of Connecticut
1376 Storrs Road
Storrs, CT 06268

Pest Management

2. Controlling Pythium with Beneficial Soil Bacteria, Washington State University. $6,200 – 2nd year

Introduction:

Diseases caused by the fungus *Pythium* can be devastating to many commercial floral crops. For example, *Pythium* can cause seedling damping-off, geranium blackleg, and poinsettia root rot. *Pythium* is a soil-borne disease favored by excessive soil moisture. Its spores may be spread by contaminated soil or water. Infected plants are stunted because of a poor root system that is unable to effectively absorb water and nutrients; stem lesions near the soil surface may cause girdling.

To control *Pythium*, growers sterilize growth media and use fungicides. Sterilization or pasteurization of growth media is time-consuming and requires special equipment. Additionally, media may become recontaminated with the pathogen. Fungicides are not always effective and may be phytotoxic to some crops.

A rapid greenhouse screening method has been developed in my lab to detect soil bacteria that increases plant growth. We found various bacterial strains that increase seedling emergence, survival, height, or dry weight in *Dianthus chinensis* 'Merry-Go-Round'. From these isolated bacteria, we selected strain V14, which increases seedling emergence and dry weight under greenhouse growing conditions where *Pythium* is present. The effect of strain V14 on additional crops and diseases has been studied. Experiments showed that the host range for V14 is broad; it enhanced growth in other species and varieties of *Dianthus* and in cucumber and marigold and controlled additional diseases. In most trials, it enhanced seeding survival, growth, and development under conditions that cause *Pythium* damping-off. It also enhanced growth in some treatments that did not include *Pythium*, so it may have some directly beneficial effects. In remaining trials, V14 had no effect or was occasionally pathogenic and actually reduced plant survival. The beneficial effects were present in approximately 50% of the trials.

Current Objectives:

The objective of the current research project is to identify the chemical characteristics of the growth medium that promote the beneficial effects of strain V14 and those that hinder its effectiveness. This information is crucial to determining the range of conditions under which the bacterium can be expected to be beneficial and to determine its potential use under commercial conditions.

The chemical characteristics that improve the establishment of strain V14 are being determined by varying the salinity, fertility, and pH levels of the growth medium. A series of experiments comparing plants treated with V14 to plants without V14 are being conducted. The effects of the bacterium on plant growth and development under these conditions are being evaluated.

Results to Date:

V14 has been applied to marigold under different salinity and fertility regimes. In the salinity experiments, the effectiveness of V14 was unaffected by salinity. Plants exhibited the typical responses to high salinity, such as reduced height and dry weight, but the response was unchanged by the addition of V14. Growth was not improved in every trial, possibly because environmental conditions and pathogenicity are not always the same.

To examine the effect of soil fertility levels on V14, marigold was grown using two different nitrogen sources. When ammonium was the sole nitrogen source, some plants with V14 did poorly. Under these conditions, seedling germination was lower and plants exhibited reduced height and dry weight. Fortunately, plants are not normally grown under these conditions. Preliminary results also indicated that the pH of the growing medium was lowered when V14 was added in the presence of ammonium. Under these acidic conditions, V14 may actually be detrimental to plant growth.

Studies are currently being pursued to examine the effect of soil pH on V14. Marigold is being grown with and without added bacteria in a non-buffered growth medium under a variety of pH regimes.

Benefits for the Floral Industry:

Beneficial bacteria applied to growing media potentially could reduce recontamination of treated media, prevent colonization of plant roots by *Pythium*, decrease phytotoxic effects from fungicides, and reduce the need for fungicides. The greenhouse environment is ideal for applying bacteria to control plant diseases. Under greenhouse conditions, factors which influence the growth of both plants and beneficial bacteria, such as temperature and moisture, can be controlled. These beneficial bacteria could be used commercially to help produce rapidly-growing, healthy, and attractive plants if the cause of the occasional detrimental responses can be determined.

Dr. Virginia I. Lohr, Project Leader
Washington State University
Dept. of Hort. and Landscape
Pullman, WA 99164-6414

3. Fungicide Sensitivity of Botrytis Cinerea Infecting Greenhouse Floricultural Crops, The Pennsylvania State University.
$10,000 – 2nd year

Objectives:

- Isolate *Botrytis* from greenhouse floricultural crops.
- Establish for each population a dosage response curve to selected fungicides.
- Compare the pathogenic and saprophytic fitness of fungicide-resistant and fungicide-sensitive populations.
- Determine the stability fungicide-resistant populations when in direct competition with fungicide-sensitive populations on plant tissue.
- Test the efficacy of methods of preventing, delaying or reversing the development of fungicide-resistant populations on plant tissue.

Results:

Botrytis populations obtained from many different greenhouses selected at random have been tested to determine their sensitivity to Benlate (benomyl), Ornalin (vinclozolin), and Daconil 2787 (chlorothalonil), Dithane F-45 (mancozeb), Zineb (zineb), Botran 75W (dichloran), and Kocide 101 (cupric hydroxide) in culture. The isolates' rate of growth in culture and production of survival structures (sclerotia) were compared. Finally, the ability of each isolate to overcome the presence of either benomyl or vinclozolin on plant tissue was tested. Tables 1 and 2 show the results of the tests. All isolates except #5 were found resistant to benomyl in culture and could overcome benomyl on the plant and cause disease. Thus, they are definitely resistant to benomyl. Six isolates were not only resistant to benomyl, they were also resistant to vinclozolin in culture and on plant tissue. Resistance was not found to any of the other chemicals tested.

Results indicate that if 50 to 500 µg of benomyl per ml of medium are required to slow growth of an isolate by 50% in culture plates, that isolate is resistant to benomyl on the plant. A relatively quick determination of the presence of benomyl-resistance in a greenhouse could be made merely by plating the suspect fungus on benomyl-containing agar and measuring its growth. Growth on vinclozolin-containing agar is not a good predictor of resistance to vinclozolin on the plant. Some isolates inhibited by as little as 0.01 to 0.1 µg/ml in culture medium are resistant on the plant while others inhibited by this amount in culture are sensitive to vinclozolin on the plant. Therefore, the only way to determine whether *Botrytis* is vinclozolin-resistant is to test it on plant tissue treated with the fungicide to see if it can overcome the chemical on the plant.

An experiment was begun in which an experimental population of *Botrytis* composed of 1 benomyl resistant spore for every 500 sensitive spores was used to inoculate plant tissue treated in one of the following ways to determine how each fungicide use pattern influences the buildup of resistance in the experimental population.

Treatments tested:

Check	Single fungicides	Mixtures of fungicides	Alternating fungicides
No fungicide	benomyl (Benlate)	benomyl + vinclozolin	benomyl>vinclozolin
	vinclozolin (Ornalin)	benomyl + chlorothalonil	vinclozolin>benomyl
	chlorothalonil (Daconil 2787)	benomyl + mancozeb	chlorothalonil>benomyl
	mancozeb (Dithane F-45)		mancozeb>benomyl

Plants were sprayed. Tissue was removed and inoculated with the experimental *Botrytis* population. After 10 days of incubation, all the new spores formed on infected tissue were harvested. Some of the new spores were tested on fungicide-containing medium to determine the percent resistant to the chemical. The remaining spores were used to inoculate a new set of fungicide-treated plant tissues. Thus, the fungus population was cycled in this manner 4 times to determine which chemical use patterns gave good control and which favored the buildup of resistance.

Vinclozolin and chlorothalonil used alone or in alternation or in a mixture gave 100% control. In the benomyl + mancozeb mixture treatment, control was good but the percent of the new spore population that was resistant to benomyl jumped to 100% after the first cycle (Figure 1). It is likely that the control was afforded by the mancozeb rather than the benomyl for the following reason. In the benomyl treated plants, control became very poor while resistance increased in the population (Figure 2). It is also likely that the 100% control obtained in the vinclozolin and chlorothalonil mixtures or alternations with benomyl was due to the vinclozolin or chlorothalonil and not the benomyl. Therefore, it is concluded that if benomyl resistance is present in the greenhouse, benomyl should not be used for *Botrytis* control.

Similar experiments are being conducted to determine what should be done if the fungus present is resistant to both benomyl and vinclozolin. To date, it appears that those two chemicals should not be used alone, in mixtures, or alternated with other materials because although control is initially acceptable, resistance increases in the population and control becomes poor. However, more experiments must be done to confirm that finding.

Benefits for the Floral Industry:

The research supported by the American Floral Endowment has shown that *Botrytis* resistance to Benlate is very common in greenhouses. Benlate and related chemicals such as Cleary's 3336, Tersan 1991, and Topsin M as well as mixed products containing Benlate-related chemicals such as Zyban and Duosan should not be relied upon for *Botrytis* control since resistant fungi quickly overcome the presence of these chemicals on plants and cause disease. Vinclozolin (Ornalin) resistance is also common in greenhouses. It is suggested that Ornalin and related chemicals such as Chipco 26019 not be used exclusively for *Botrytis* control. On the crops for which the following chemicals are registered, more reliance should be placed on contact protectants such as chlorothalonil (Daconil 2787, Exotherm Termil), mancozeb (Dithane), cupric hydroxide (Kocide 101) and zineb in combination with rigorous humidity control in order to protect plants against *Botrytis*.

Even greenhouse operations that have never used Benlate or Ornalin are at risk to *Botrytis* populations resistant to these chemicals since the fungus may be on plants purchased from other greenhouses where these chemicals are used. It is very likely that fungicide-resistant *Botrytis* is being shipped throughout the industry inadvertently. This is evidenced by the fact that an apparently healthy cyclamen purchased from a retail florist was later found to be infected with an isolate of *Botrytis* resistant to both vinclozolin and benomyl. Apparently healthy plants but *Botrytis*-harboring plants can be easily sent from a propagator to someone finishing the plants. By clearly documenting this problem of fungal resistance to systemic chemicals, we hope to influence EPA and chemical companies to maintain the registration of the older, contact protectant materials since resistance to these materials has not been found while resistance to the newer, systemics is becoming common.

Table 1.
Isolates and Growth Characteristics

Isolate No.	Host	Optimum temperature of growth (°C)	Mean growth rate (mm/hr)[w]		Mean weight of sclerotia formed (g)[w]	
4[x]	begonia	25	0.393	a	0.072	bc
1	geranium	21	0.396	a	0.042	abc
13	peperomia	21	0.379	ab	0.061	abc
2	geranium	21	0.367	b	0.060	abc
7	geranium	25	0.367	b	0.054	abc
17a[x]	geranium	21	0.374	b	0.069	abc
14	geranium	21	0.338	cd	0.044	bc
9	geranium	21	0.342	cd	0.055	abc
15	geranium	21	0.326	de	0.063	abc
3	miniature rose	21	0.318	ef	0.082	ab
6	geranium	21	0.318	ef	0.071	ab
8	geranium	21	0.318	ef	0.028	c
16	geranium	25	0.304	fg	0.063	abc
18[y]	cyclamen	21	0.298	gh	Not tested	
10[z]	geranium	25	0.281	hi	0.046	bc
11[z]	petunia	25	0.264	i	0.062	abc
12[z]	fuchsia	25	0.273	i	0.045	bc
5[x]	geranium	21	0.211	j	0.000	e

[w] Numbers followed by the same letter are not significantly different according to Bonferroni(Dunn) t-test.
[x] Isolates 4, 5, and 17a came from one greenhouse but were collected on different dates.
[y] Isolate 18 came from a plant purchased at a retail florist shop.
[z] Isolates 10, 11, and 12 came from one greenhouse and were collected on the same date.

Table 2.
Comparison of ED_{50} (amount of fungicide necessary to slow growth by 50% as compared to growth in the absence of fungicide) and Fungicide Resistance on plant tissue.

Isolate No.	Sporulates on plant leaf tissue treatedwith benomyl	ED_{50} range for benomyl in culture plates	Sporulates on plant leaf tissue treated with vinclozolin	ED_{50} range for vinclozolin in culture plates
3	+	50-500	+	0.01-0.1
7	+	50-500	–	0.01-0.1
14	+	50-500	–	0.01-0.1
16	+	50-500	–	0.01-0.1
1	+	50-500	+	0.1-1.0
2	+	50-500	+	0.1-1.0
6	+	50-500	–	0.1-1.0
8	+	50-500	+	0.1-1.0
9	+	50-500	–	0.1-1.0
11	+	50-500	+	0.1-1.0
12	+	50-500	–	0.1-1.0
13	+	50-500	–	0.1-1.0
15	+	50-500	–	0.1-1.0
18	+	50-500	+	0.1-1.0
5	–	<0.5	–	0.1-1.0
4	+	50-500	+	>1.0
10	+	50-500	+	>1.0
17a	+	50-500	+	>1.0

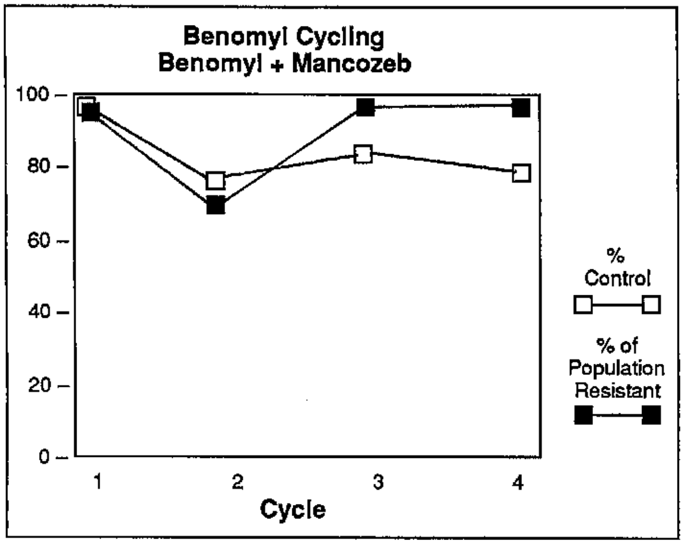


Figure 1. Plant tissue was treated with a combination of benomyl (Benlate) and mancozeb (Dithane F-45) and then inoculated with a population of *Botrytis* spores containing 0.02% resistant spores. Spores formed on the tissue by the end of the first cycle were then used to inoculate plants to initiate the second cycle and so on through four cycles.

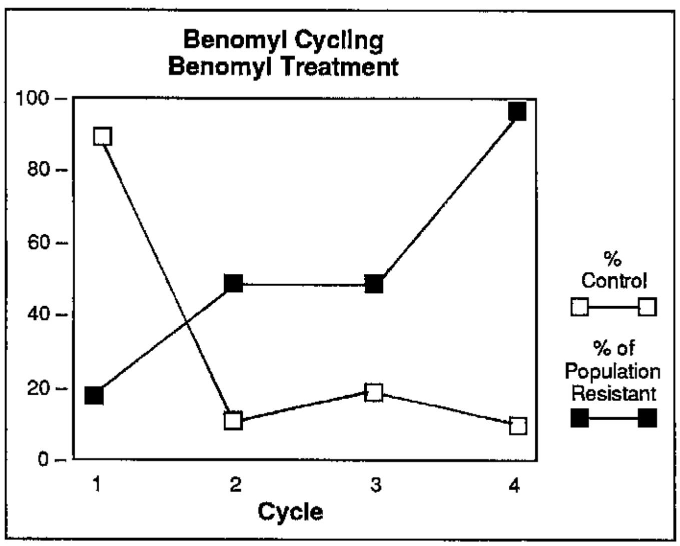


Figure 2. Plant tissue was treated with benomyl (Benlate) and then inoculated with a population of *Botrytis* spores containing 0.02% resistant spores at the beginning of the first cycle. Spores formed on the tissue by the end of the first cycle were then used to inoculate plants to initiate the second cycle and so on through four cycles.

Dr. Gary W. Moorman, Project Leader
The Pennsylvania State University
211 Buckout Lab
University Park, PA 16802

4. Control of Botrytis Cinerea on Rose, University of California, Davis.
$9,000 – 3rd year

Objectives:

The overall objective of this research is to develop an integrated pre- and postharvest control program for *Botrytis cinerea* in greenhouse production systems. The specific objectives of the proposal are:

- Further development of the biological control agents identified from earlier work.
- Investigate the potential of manipulating the greenhouse environment to reduce disease.

Objectives of previous work funded by the Endowment are:

- Develop chemical and cultural control methods for postharvest control of *B. cinerea.*
- Isolate and identify potential biological control agents that occur naturally on roses.
- Test the control agents against *B. cinerea* during production and storage of roses.
- Develop small scale production systems of the most effective isolates for testing in commercial conditions.

Results to Date:

Wind Experiments: A wind speed of at least 30 feet per minute (1/3 of a mile per hour) is sufficient to reduce the development of Botrytis blight if the wind was applied at time of inoculation. When the application of wind was delayed after inoculation, disease control could still be achieved if the wind was started up to 36 hours after inoculation, but was not effective if started 48 hours after inoculation. In general, disease was reduced to about 20% of the controls, in which the petals were inoculated and placed in the wind tunnels but no wind was applied. Increasing the wind speed up to 60 feet per minute still controlled the disease only if it was started within 36 hours of inoculation. In fact, none of the wind speeds tested (0, 15, 30, and 60 feet per minute) had a significant effect on disease unless they were started within 36 hours of inoculation. Although a wind speed of 15 feet per minute reduced disease severity, the optimum disease control was not obtained until a wind speed of 30 feet per minute was applied.

Drying Experiments: When roses were inoculated with *Botrytis* and then kept wet for different periods of time, disease increased steadily as the period before drying increased. Even only one hour of incubation before placing the roses in the low relative humidity to dry them was sufficient for small amounts of disease. There was, however, a sharp increase in disease severity after 10 hours of incubation.

Benefits for the Industry:

The results of this research will provide floral production systems with an integrated approach to control of *Botrytis cinerea*. The program will be based on sound ecological principles and will resort to fungicides only in severe situations, and then only as a postharvest treatment. This will minimize applicator exposure, environmental pollution, and pressure for development of pathogen resistance. The research on chemical based postharvest control measures resulted in the registration for Phyton 27, a copper based fungicide, for use as a post harvest dip for roses. Development of the biological control measures will be dependent upon further research, however patents were submitted and cooperative efforts are being developed with private industry to produce experimental formulations of the organisms. The cultural control efforts have resulted in the discovery that when plants are grown in the greenhouse under winter conditions they are more susceptible to *Botrytis cinerea*, even if post inoculation conditions are kept constant. We have also determined that wind (generated by horizontal air fans) is a useful tool to reduce Botrytis blight.

Dr. James J. Marois, Project Leader
University of California
Dept. of Plant Pathology
Davis, CA 95616

5. Epidemiology and Control of Tomato Spotted Wilt Virus in Floral Bedding Plants, North Carolina State University.
$19,500

Research on tomato spotted wilt virus (TSWV) conducted by this group, which was supported wholly or in part by the American Floral Endowment, has had as its primary objectives the collection, characterization, and detection of TSWV and TSWV-LIKE viruses which are found in the floral industry. A significant finding by this group was a TSWV-LIKE isolate which was not recognized by existing antisera or by some biological assay techniques. The inability to confidently diagnose TSWV was the fundamental problem that prompted our involvement with TSWV. The lack of confidence in the available procedures to confirm the presence (or absence) of TSWV in floral crops resulted in considerable confusion.

Dr. James W. Moyer

We have identified this virus' host range, perfected isolation procedures, produced an antiserum and are currently completing the characterization of this isolate. This new virus (TSWV-I) has several characteristics which distinguish it from the typical TSWV isolates. In general, the concentration of TSWV-I in host tissue is lower than that of TSWV. However, the greatest difference is in their biochemical composition. Each virus particle consists of the viral RNA and 3 major proteins. Antisera recognize the viruses by reacting with the viral proteins. Two of the proteins in TSWV-I are similar and react weakly with TSWV antiserum while one of the proteins (the predominant one) does not react at all. This is the reason for the TSWV-I isolates giving either negative or only slightly positive results in serological tests such as ELISA. The new antiserum which recognizes TSWV-I has been made available to the industry through a commercial diagnostic company. It is currently being used by scientists and commercial flower growers throughout the United States. It now appears that the newly recognized isolate, TSWV-I, is more prevalent in floral crops than is the common type of TSWV.

In addition to the research we have in progress to better understand this new type of TSWV, we are continuing to monitor TSWV infections in floral crops to develop a more compete understanding of the diversity of TSWV and TSWV-LIKE viruses which exist in floral crops. Some of the more frequently encountered crops include anthurium, begonia, chrysanthemum, cineraria, dahlia, exacum, gladiolas, gloxinia, impatiens and stephanotis. Symptoms vary not only between different crops but may also vary between cultivars of the same crop. Recently we have isolated another virus which is similar to TSWV but reacts poorly with existing antiserum. We are also conducting preliminary investigations for the development of plants which carry genetically engineered cross-protection, a new method of controlling plant viruses.

Dr. James W. Moyer, Project Leader
North Carolina State University
Agricultural Research Service
Dept. of Plant Pathology, Box 7616
Raleigh, NC 27695

6. Plant Resistance for Management of Greenhouse Whitefly on Poinsettia, Cornell University.
$22,460 – 2nd year

Objectives:

- Determine the degree of resistance/susceptibility to the greenhouse whitefly (GHWF) of a wide variety of poinsettia (*Euphorbia pulcherrima*) cultivars in order to identify resistant germplasm.
- Determine the impact of plant resistance on host plant acceptance, reproduction, and population biology of GHWF.
- Investigate mechanisms of poinsettia resistance to GHWF.
- Compare the efficacy of insecticides against GHWF on resistant and susceptible varieties.

Results to Date:

We have screened 26 commercial poinsettia cultivars for resistance to GHWF. In some tests, GHWF were allowed to "choose" among these cultivars to identify which ones were "preferred" and support the largest numbers. In other tests, GHWF adults were confined (no choice) to leaves of each cultivar to examine their reproduction, survival, and developmental times. Leaf hair (trichome) numbers (which may influence GHWF numbers) and leaf color reflectance (which may influence GHWF attraction) have been characterized for many cultivars. A detailed study of the biology of both GHWF and sweetpotato whitefly (SPWF) on two cultivars that contrasted in our initial screening studies has been done. We have examined the influence of leaf color on the initial attraction of GHWF adults. Evaluation of wild *E. pulcherrima* from Mexico and several other *Euphorbia* species has been initiated to screen for resistance in "wild" germplasm.

GHWF numbers (both adults and nymphs) can vary significantly among poinsettia cultivars. We have seen as much as a 7-fold difference in immature and adult numbers among the 26 commercial varieties evaluated thus far, with a tendency toward higher infestations on cultivars with lighter colored leaves, although there are notable exceptions to this tendency. Preliminary tests indicate little difference in GHWF biology on native ("wild") *E. pulcherrima* compared with most commercial varieties. We have found no obvious difference in the number of eggs laid on upper vs. lower leaves of the same plant of any cultivar when adults were confined to individual leaves, but significantly more adults and nymphs resulted on upper leaves when adults were allowed to choose leaves for egg laying. We have determined experimentally that both GHWF and SPWF are initially more attracted to lighter-colored leaves than dark leaves. However, additional unknown plant characteristics appear to subsequently influence their "decision" to remain on a leaf, feed, and/or lay eggs. These additional characteristics may explain why GHWF numbers can also be high on some dark-leaved varieties. We have found two cultivars on which GHWF laid significantly more eggs, immature survival was higher, and developmental time was faster than on most other cultivars. Whitefly control may be more difficult on these varieties. We have also identified several cultivars on which GHWF immatures develop more slowly. Varieties that cause GHWF to develop slowly may produce unhealthy whiteflies that may be easier to control, or the whiteflies may remain longer in life stages that are susceptible to insecticides or parasitoids. SPWF required an average of a week longer (average total developmental time = 39 days) to develop from egg to adult than GHWF (average total developmental time = 32 days) on two popular cultivars, at temperatures fluctuating between 65° and 75°F. Both SPWF and GHWF remained in life stages that are naturally tolerant to most insecticides (e.g., egg and pupal stages) for approximately half of their total immature developmental time. Natural mortality during immature development was greater with SPWF (31% dead) than with GHWF (22% dead). However, preliminary observations also indicate that SPWF lay more eggs on poinsettias than GHWF. In summary, variation in GHWF and perhaps SPWF numbers among these 26 cultivars is apparently a result of factors that influence adult attraction to the plants, egg-laying, and immature developmental time. We are working to identify these factors to learn how to exploit them for whitefly control.

We will soon compare whitefly chemical control on several poinsettia cultivars to determine if the degree of whitefly control can be influenced by plant/cultivar characteristics. We have evaluated more than 20 insecticides for whitefly control in order to identify suitable insecticides. Several materials were suitable against all immature life stages, except eggs and pupae, including Avid, Neem extract, several pyrethroids (Mavrik, resmethrin, Talstar, and Tempo; provided that insecticide resistance wasn't excessive), Orthene, and Vapona. Insecticidal soap gave good control of all immature stages except eggs, while Safer's Ultrafine spray oil was effective against all immature stages, including eggs and pupae.

We also plan to investigate the ability of the whitefly parasite, *Encarsia formosa*, to parasitize GHWF on various poinsettia cultivars. Biological control of whiteflies on poinsettia is a very promising control strategy. However, research on other greenhouse crops has shown that the parasite's efficiency can vary on different cultivars. This information should be known for poinsettia, and would complement biological control studies underway by ourselves and other entomologists.

Anticipated Benefits:

Knowledge of plant resistance factors to whiteflies in floricultural crops can be a valuable tool in breeding programs, and would make a significant contribution toward the biology and control of these major pests. Screening popular cultivars for plant resistance can give growers information on which cultivars should be carefully inspected and monitored for pest populations. If we can identify factors that attract adult whiteflies to the plants and influence egg-laying, we may be able to manipulate these factors for better whitefly control. Better chemical control of whiteflies, with less insecticide, may be achieved on resistant varieties than on susceptible ones. Resistant crop varieties may be integrated with biological control organisms for better non-chemical pest control. Lastly, once identified, it may be possible to introduce plant factors which confer resistance into susceptible cultivars by means of tissue culture and other biotechnological procedures. A thorough investigation of the degree of resistance in different poinsettia varieties to the whiteflies is an important contribution to an integrated pest management program for this crop.

Dr. John Sanderson, Project Leader
Cornell University
Department of Entomology
Comstock Hall
Ithaca, NY 14850

7. Development of Monoclonal Antibodies (MCA) for Detection, Identification and Separation of Tomato Spotted Wilt Virus Strains, University of Hawaii.
$10,500

The tomato spotted wilt virus (TSWV) seriously affects production of food, fiber and ornamental crops worldwide. The worldwide importance of TSWV is reflected in recent reports indicating the potential of TSWV epidemics in agroecosystems on mainland U.S.A., in Canada, Australia and India.

TSWV is unique from other plant viruses in that: a) it has one of the widest host ranges of any plant virus; b) it is the only virus transmitted in a circulative manner by certain species of thrips; c) it is highly unstable in vitro; and d) it is covered by a lipoprotein envelope.

In Hawaii, TSWV seriously affects production of lettuce, tomato, pepper and chrysanthemum. The disease is a contributory factor when growers gave up producing tomato, lettuce and romaine. On Oahu, tomato is no longer produced in the Leeward side of the island. On the mainland U.S.A. TSWV has become increasingly important. Endemic in California, the disease has caused substantial losses in chrysanthemums throughout the state. TSWV epidemics have occurred in several Southern states including Alabama, Arkansas, Georgia, Louisiana, Mississippi, and North Carolina affecting tomato, pepper, peanut, tobacco and flowering ornamentals. Recently, the disease has seriously affected ornamentals grown under greenhouse culture in the northeast and is considered a major problem facing the greenhouse industry today. Why the disease has become more prominent in the mainland U.S.A. is not clear, but it has been suggested that the establishment of the western flower thrips east of the Rocky Mountains, development of insecticide resistance by these thrips, movement of infected plant materials between states, and difficulties in the detection and diagnosis of this disease have contributed to aggravating the problem.

It is well established that different strains of the virus exist. These strains not only differ in respect to host virulence and symptom expression but also may differ serologically as in the case of the common lettuce and impatiens strains. Variation in the virulence of different strains has been a major problem in previous attempts at developing resistant varieties in tomato and still poses a major hurdle for the identification and development of resistant germplasm in any plant species. This is due to the existence of pathotypes of TSWV. Five to six pathotypes have been determined on the basis of differential host responses by diagnostic plants.

Strain separations which rely on diagnostic plant hosts can be at times misleading and at the very least time consuming and costly. Development of rapid, sensitive, and specific detection and separation methods of TSWV strains will facilitate genetic breeding programs and be a useful tool in epidemiological studies that trace and identify origins of TSWV infections.

Convention serology based on the enzyme linked immunosorbent assay (ELISA) has been useful for TSWV detection in reservoir plant host and its insect vector. This has been used as the major means for TSWV diagnosis. However, conventional serology has provided little information for the delineation of pathotypes.

Hybridoma technology (somatic cell fusion) has provided a new and powerful method of producing antibodies specific for individual antigenic determinants. MCA offer several advantages over conventional polyclonal antiserum: a) an unlimited quantity of antibody can be produced from a small quantity of antigen; b) pure antibodies specific for a single antigenic determinant can be obtained even when the initial immunogen is not pure; c) hybridomas can be preserved frozen in liquid nitrogen assuring a continuous supply of antibody; d) MCAs eliminate qualitative and quantitative variability in specific antibody content found in different batches of polyclonal serum.

We have employed this strategy in preliminary studies to generate monoclonal antibodies (MCA). Two MCAs were found to differentiate between two TSWV strain groups. Based upon the need for quick detection methods of TSWV strains and the promising preliminary results generated, this project proposes to generate and select MCAs which can differentiate between selected TSWV strains.

Summary of Research and Results to Date:

Three TSWV strains have been selected for MCA development. These strains can be readily separated biologically from each other based upon symptom development on diagnostic host plants. For example, only two of these strains readily infect tomato plants where one produces ringspots and the other produces tipblight symptoms. These strains have been grown in tobacco plants and purified for antisera production using standard purification procedures. Two mice have been immunized with a mixture of the three strains in hopes of generating antibody producing cell lines which could separate between the strains. Several antibody cell lines were generated, however, none were TSWV-specific. All antibodies reacted only to the plant host. Therefore we developed an additional step for the purification of TSWV in which we were successful in eliminating plant host materials from virus preparations for use in future immunizations. This additional purification step uses affinity chromatography methodology where Dr. John Sherwood's TSWV-specific MCA was used to separate TSWV from plant host materials.

Anticipated Benefits for the Floral Industry:

The anticipated benefits to the floral industry are a) the development of a method that would make possible rapid field assays to identify plants infected by the virus, identify strains of the virus, to follow population dynamics of different strains, and to determine the origin, prevalence, and spread of strains in floral crops; b) provide a method that will be more specific, as and probably more sensitive than presently available detection methods; and c) provide for a stable, consistent and continuously available antibody source which can be used in both basic and applied applications by research, extension, and industry.

Dr. John J. Cho, Project Leader
University of Hawaii
HITAHR
P.O. Box 269
Kula, HI 96790

8. The Development of Integrated Pest Management Strategies in Floriculture, University of California, Davis. $40,865 – 2nd year

Biological Control Studies

Biological control studies with the western flower thrips were quite successful, with good results achieved when large numbers of predaceous mites in the genus *Amblyseius* were released on a per leaf basis. Adding pollen improved control in most cases. Although 100% control was not achieved, control was obtained that would be acceptable to most growers. The feasibility of releasing large numbers of mites per acre is good due to the low cost ($1.50/1000 mites) and their availability from several sources in North America.

Studies with biological control of aphids using the fungus *Verticillium lecanii* have been disappointing due to the variability of results obtained. In laboratory and controlled field conditions, good control has been achieved. However, in trials with cooperating growers, results were not so dependable even where the aphid densities were high and environmental conditions appeared good for infection. A procedure has been worked out where growers can isolate this fungus from their own ranges and culture it on standard media. Extraction and application procedures have also been developed so that growers can use this fungus for control in their operations.

A massive program was initiated on gerbera grown for cut flowers where we tried to deal with the multiple pest complex that attacks this crop: greenhouse whiteflies, western flower thrips, melon aphid, leafminers and twospotted spider mites. Starting from crop inception, satisfactory control of all these pests was obtained with regular releases of natural enemies with the exception of the greenhouse whitefly. Despite regular releases of the whitefly parasite, *Encarsia formosa*, into the crop, very little parasitism was obtained. We have since repeated this exercise with gerberas grown for cut flowers as well as in pots with essentially the same results. It appears that although *E. formosa* is an excellent parasite of the greenhouse whitefly, it cannot be used on gerbera. We suspect that there is a problem with the host plant; something about gerbera interferes with the ability of the parasite to successfully parasitize the whitefly. This will be investigated in more detail in 1990. A different parasite species may have to be used for biological control of whiteflies on gerbera.

A biological control trial is currently underway on chrysanthemums where releases of the parasite, *Diglyphus begini*, are being made for biological control of two leafminer species, *Liriomyza trifolii* and *L. huidobrensis*. Results from this trial are intended to provide information on the numbers of parasites necessary to release in order to achieve satisfactory control.

Biological Studies

Basic biological studies on the leafminer, *L. trifolii* have been completed with the objective of trying to understand how this leafminer is capable of expanding its host range and is able to move from host to host so readily. Also, studies have been completed on the complex interaction of leafminer damage and its subsequent effects on the yield of marigolds grown for seed. Considerable effort has gone into understanding the parasite, *D. begini*, and we have made great strides in terms of the insect's attack behavior, host preference, basic biology, how it determines the sex of its offspring, and how it can be effectively used in a biological control program.

Studies on the biology and ecology of western flower thrips are completed. Life history studies of *F. occidentalis* (Pergande) were conducted at six constant temperatures and temperatures fluctuating around 27.2 degrees C. Development from egg to adult was shortest at 30 degrees and was faster at the constant 27.2 degrees than under fluctuating temperatures. The net reproductive rate of females, Ro, was greatest at 27.2 degrees and the intrinsic rate of increase, rm, was lowest at the temperature extremes. Females maintained at constant 27.2 degrees produced almost twice as many offspring as females maintained under fluctuating temperatures. Widely fluctuating temperatures in the greenhouse may help to reduce the population of western flower thrips (a prerequisite here is that plants must do well at these temperatures).

Frankliniella occidentalis is capable of transmitting tomato spotted wilt virus to numerous plant species. When larvae of this thrips were exposed to virus-infected chrysanthemum leaves, larval development times were shortened and mortality was greater compared to larvae exposed to healthy plant material. Of the individuals which survived to adulthood, 90% transmitted virus to healthy chrysanthemum plants.

Blue and yellow colored traps were most attractive to *F. occidentalis*. Blue sticky cards are now available commercially in the United States. Mark recapture studies demonstrated that adult thrips were trapped at greater distances from the release point in a greenhouse containing a non-preferred host such as poinsettias, then in greenhouses with a preferred host such as roses. Analysis of the mean and variance data from yellow cards indicated that an average of 5 traps per hectare was sufficient to estimate *F. occidentalis* populations.

In a carnation greenhouse, the number of thrips captured on yellow cards inside was not related to the density of thrips captured on yellow cards outside the greenhouse. However, this could have been due to the physical structure of the wide open carnation greenhouse. In roses, thrips captured above the crop were correlated with the numbers entering the greenhouse. In addition, the number of thrips present in the rose flowers was correlated with the number caught entering the greenhouse the week before. Therefore, yellow cards can be a useful tool in predicting injury and thrips densities in rose flowers. Significant differences were observed in the numbers of *F. occidentalis* in flowers of different rose and carnation cultivars. The number of thrips per flower was correlated to the percent reflectance of the flower at 475 nanometers.

Studies on the host plant preferences of both adults and larvae of the beet armyworm (*Spodoptera exigua*) have been completed using chrysanthemum as the host plant. Although larvae exhibited a clear preference for different cultivars, adults seemed to oviposit at random, even on non-host plants where larvae could not develop. More basic studies have been completed where the underlying mechanisms of host plant preference exhibited by larvae for different chrysanthemum cultivars was investigated.

Studies on the development of the green peach aphid (*Myzus persicae*) and the cotton aphid (*Aphis gossypii*) on chrysanthemum have been completed. From these studies it appears that the green peach aphid is less suited to chrysanthemum than the cotton aphid. The green peach aphid was generally found distributed all over the plant while the cotton aphid was usually found in the central growth point. Also, *M. persicae* was generally more active than *A. gossypii* and produced more winged individuals. This suggests that yellow cards for monitoring may pick up infestations of the green peach aphid more quickly than for infestations of the melon aphid.

Research has been completed on the evaluation of host preferences for the sweetpotato whitefly and greenhouse whitefly and this has confirmed preliminary information reported last year. The sweetpotato whitefly performs better on poinsettia and the greenhouse whitefly does better on gerbera. The sweetpotato whitefly has a larger host range than greenhouse whitefly and can quite easily attack crops such as chrysanthemum.

Pesticides and Resistance

While the future holds little promise for conventional insecticides, intense interest has focused on the registration of Insect Growth Regulators (IGRs) for the ornamentals industry. One of the most promising of these is the material buprofezin (Applaud) made by Nor-Am which performed

Physiology

10. Measurement of Nitrogen Leaching Losses from Greenhouse Roses, University of California, Davis.
$8,500

Objectives:

There is presently concern regarding the contamination of ground waters and surface waters by fertilizers from agriculture. High fertilizer application rates are commonly used in producing many greenhouse crops, and in some cases much of the applied fertilizer is lost in runoff and leaching. Water rich in nutrients emanating from nurseries is obviously a potential pollutant to surrounding water supplies, and managers should attempt to reduce this water discharge from their nursery. Ideally, greenhouse managers should strive for fertilization and irrigation management practices which minimize fertilizer losses. The goal should be to use the minimum fertilizer and leaching rates (resulting in minimum pollution of the environment) which at the same time preserve maximum productivity.

The major objectives of this study are to measure the nitrate leaching losses from the rootzone of greenhouse roses for different N concentrations in the irrigating solution and for different leaching rates. We will also measure the effects of these practices upon flower yield.

Results to Date:

Single bare root Royalty roses were planted on July 28th into 5 gallon containers of well fertilized medium. 48 containers were placed on 1 ft. centers on raised benches and irrigated with a 0.25 strength Hoagland's solution for the next month. On August 30th two irrigation experiments were started. Experiment I consisted of irrigating with 3 complete nutrient solutions containing 75, 150 and 225 ppm N respectively; Experiment II consisted of irrigating with 3 leaching rates: 15, 30 and 50% leaching fractions. These treatments cover extremes in both applied N concentration and leaching rate. For both experiments volumes of solution applied and leached were recorded at each irrigation, and the concentration of NO_3-N and NH_4-N in the Leachate was measured at that time. Since beginning the treatments, irrigation frequency has been 2-3 times per week. Starting September 27, roses were harvested (open bud stage); stem lengths were between 40-50 cm. The average dry weight yields for this first harvest are presented in Table 1.

Table 1.
Stem Dry Weights for 'Royalty' Roses.

	Experiment I ppm N in irrigation solution			Experiment II Leaching rate - %		
	75	150	225	15	30	50
Dry wt. per stem - g.	8.1	7.8	8.3	7.6	8.0	8.2
Stems per sq. ft.	5.5	4.8	5.7	4.9	4.8	4.4

There were no statistical differences among yields or among numbers of stems per square foot within the same treatment. Thus, for the first harvest neither N concentration nor leaching rate had any effect upon rose flower yields.

A summary of the cumulative average nitrogen leaching loss data for both experiments is presented in Table 2. The data are for the period from July 28 to October 26th.

Table 2.
Comparison of N Applied, N Leached, and Electrical Conductivity for Different N Concentrations and Leaching Rates.

	Experiment I ppm N in irrigation solution			Experiment II Leaching rate - %		
	75	150	225	15	30	50
N Applied* g/sq. ft.	4.0	6.0	8.7	4.6	5.7	8.13
N Leached g/sq. ft.	1.0	2.1	2.8	0.7	1.9	4.0
EC of Applied Solution - dS/m	1.5	1.7	1.9	1.7	1.7	1.7
Leachate EC-dS/m	3.2	3.2	4.2	3.4	3.1	2.8

*Includes 1.4 g N added at planting.

The amount of N applied and the amount of N leached varied directly with applied N concentration (Exp. I) and leaching rate (Exp. II). The lowest amount of N leached (0.7 g/sq. ft.) was in the low leaching treatment for Exp. II while the greatest amount leached (4 g/sq. ft.) was in the high leaching treatment – a difference of almost 7 fold. It is apparent from these data that the amount of N leached can be greatly reduced by either reducing the applied N concentration or reducing the leaching rate. The EC of the leachate (which is approximately twice the EC of a saturation extract) also increased with concentration of applied

N, but decreased with leaching rate. For the first harvest yields were not affected by any of the treatments; however, it is too early to rule out effects upon future harvests.

Benefits for the Floral Industry:
It is hoped that results from this study will provide practical guidelines for N fertilization and irrigation practices which will minimize loss of nitrogen from greenhouse roses.

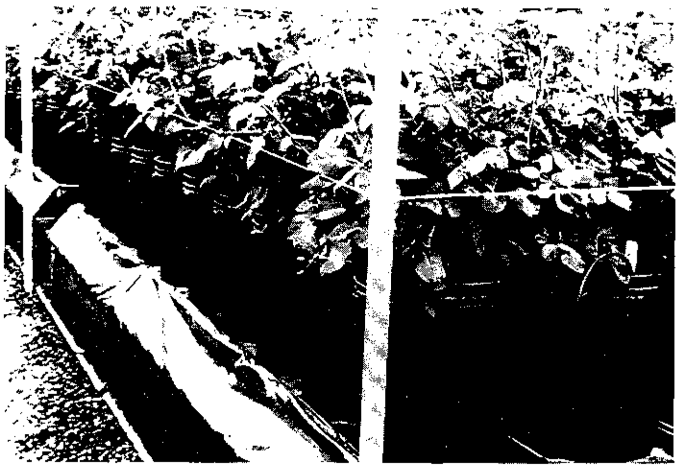


Fig. 1. Five-gallon containers of 'Royalty' roses used in N leaching study, arranged on 1-foot centers on raised benches. Each container is irrigated automatically by an individual spray stake.

Fig. 2. Following each irrigation, leachate is captured and then analyzed for mineral N content (NO_3^- and NH_4^+) to determine the amount of N lost by leaching.

Dr. Jack L. Paul, Project Leader
University of California
Environmental Horticulture
Davis, CA 95616

Post Production Studies

11. Post-Greenhouse Evaluations of Forced Bulbous Plants, University of Florida, North Carolina State University.
$5,000

Objectives:
To identify methods to maximize interior longevity of flowering potted bulbs at retail and consumer levels.

Results:
Interior longevity of flowering potted bulbs has been extended by 10 days or more on a wide range of potted bulbous plants by altering interior temperature and light levels. Potted tulips lasted 18 days when maintained at 65°F compared to 8 days at 80°F. Similar results were observed on amaryllis, narcissus, hyacinth, freesias, oriental lilies, and asiatic lilies. However, quality is also affected at the higher temperatures. Freesias placed at 80°F developed yellow leaves within 3 days after placement in the interior rooms, and a large number of the buds failed to open. No leaf problems were observed on plants at 65°F. Also, tulips opened rapidly at the higher temperatures, thus decreasing the aesthetic appearance of the plants and flowers. Light level (50 - 100 ft-c.) generally had a negligible influence on plant longevity and quality when compared to the effects of interior temperature.

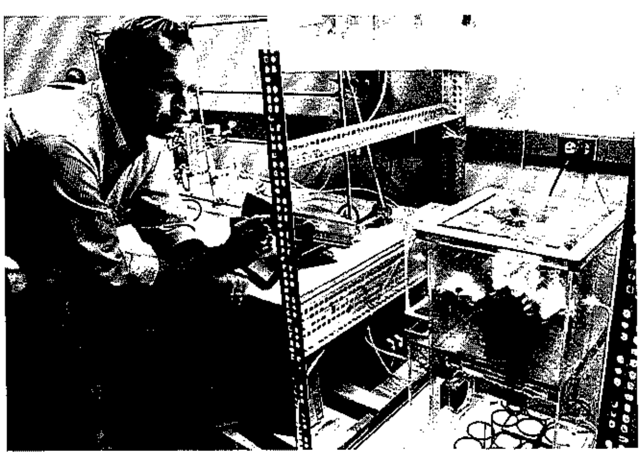
Benefits:
These results demonstrate the opportunities which exist for retailers and consumers to extend longevity and increase quality of flowering potted bulbs. Development of the information in this project emphasizes that flowering potted bulbs can provide consumers with good interior performance for 7 - 10 days or longer when handled and maintained properly.

Dr. Terril A. Nell, Project Leader
University of Florida
1505 Fifield Hall
Gainesville, FL 32611

12. Physiological and Hormonal Factors Related to Longevity of Flowering Potted Plants, University of Florida.
$11,700 – 2nd year

Objectives:
a) To determine production, shipping, and interior conditions which will increase the interior longevity of flowering potted plants, and b) to develop an understanding of the factors involved in these processes than can be related to and used in the production and handling of these plants.

Results:
Procedures which can increase interior longevity of flowering potted plants by 7 - 14 days, while maintaining plant quality and appearance, have been developed. For instance, compared to plants receiving fertilizer until flowering, chrysanthemums last 10 - 14 days longer when fertilizer applications are terminated 3 weeks prior to marketing. Our results show that at flowering a majority of the reserve carbohydrates are located in the chrysanthemum stems. Sucrose, fructose, and glucose levels in leaves and stems decrease once plants are moved indoors, and it appears the reduction is a result of the translocation of these carbohydrates to the chrysanthemum flower. Also, proper interior conditions will increase the longevity of flowering potted plants. Poinsettia varieties 'Annette Hegg Dark Red' and 'Gutbier V-14 Glory' lost nearly all leaves when placed at 80°F at flowering with 25 ft-c. of light for a 30 day interior simulation period, while plants receiving 100 ft-c. of light at the same temperature lost less than 25% of the leaves in the same period. Plants maintained at 65°F dropped few leaves during the 30 day interior period, regardless of light levels (25 - 100 ft-c.).



Dr. Terril A. Nell

Benefits:
These results provide growers, retailers, and consumers with procedures to increase longevity, thus providing higher quality, longer lasting products to the consumer.

Dr. Terril A. Nell, Project Leader
University of Florida
1505 Fifield Hall
Gainesville, FL 32611

Production Technology

13. Floriculture Environmental and Modeling Research at MSU, Michigan State University.
$44,500

The floriculture program at Michigan State is committed to helping solve problems facing the greenhouse industry. Three of the most important problems facing the greenhouse industry today are a) the need to control water and fertilizer runoff from greenhouses, b) the need to reliably schedule plant crops to meet buyer specifications, and c) the need to control plant growth with minimal use of chemicals. Minimizing the use of fertilizers and growth retardant chemicals is important for environmental, employee safety, and economic reasons.

The first objective of this research program is to minimize fertilizer and water runoff from greenhouses. The work under this objective is concentrated in four main areas:

- Fertilizer application methods and rates
- Plant pathogens in recirculated water
- Root media physical and chemical properties
- Water quality management

The second objective is to identify methods to predict plant growth and development, and development of nonchemical methods to control plant growth. The work covered by this objective is directed at:

- Control of stem elongation by day and night temperature
- Modeling the growth and development of poinsettia
- Modeling the growth and development of the Easter lily
- Development of models of growth on other plants
- Development of grower management tools

Funding from the American Floral Endowment has supported graduate student research projects in a number of areas. Over the past year, significant progress has been made in each of the project areas outlined.

Fertilization: Fertilizer recommendations for greenhouse production normally suggest a specific nutrient concentration be applied without any regard for the difference in the leaching of solution from the container. In our research, poinsettias, Easter lily, bedding plants and chrysanthemum have been grown with subirrigation and recirculated nutrient solutions. The results clearly demonstrate that if less volume of water is applied, lower fertilizer concentrations can be applied and runoff is reduced. Depending on the watering method used, the amount of nitrogen applied in one experiment was 10-fold different and the amount of nitrogen runoff was 40-fold different. Several experiments are currently in progress to identify minimum nutrient levels in the root media required for poinsettia production.

Pathogens: The potential distribution of plant pathogens is a concern when irrigation water is recirculated. There was no evidence of *Pythium ultimum* movement from an inoculated media to other plants grown in the same subirrigation or topwatering system when the irrigation water was recirculated. In two different tests under different conditions however, *Pythium aphanidermatum* moved from inoculated media to plants watered with recirculated water.

Root Media: Subirrigation with recirculated water depends on water movement into the pots through capillary action. Root media and wetting agents can influence water uptake. The efficiency of traditional watering systems also depends on the root media water and nutrient holding capacity. An experiment is in progress with poinsettias in five root media with biweekly root media analysis and constant monitoring of irrigation requirements and runoff.

Water Quality: If we are to conserve water resources, the greenhouse industry must learn to manage water quality problems. Two experiments have been completed demonstrating the effect of water alkalinity on root media pH during geranium production. The effect of water quality, alkalinity, and acidification on the rooting of poinsettias under mist propagation was also studied. In this test, rain water was an inexpensive, viable alternative to water treatment.

Stem Elongation: Stem elongation is primarily controlled by the difference (DIF) between day and night temperature. As DIF increases, stem elongation increases. Pulses of low temperatures for 2 hours immediately at sunrise provided significant reductions in stem elongation even if the low temperature was not maintained throughout the entire day. The DIF concept is being used by commercial growers of flowering pot, bedding, and cut flower plants to promote or reduce the amount of stem elongation without the use of chemical growth regulators. Since there are no growth retardants currently labeled for use on vegetable transplants, the use of a negative DIF will become a primary method of controlling height during the coming spring season.

Poinsettia Modeling: Stem elongation in the poinsettia is strongly influenced by DIF. Development rate in contrast, is primarily controlled by average daily temperature in the temperature range of 50 to 80°F. Night temperatures above 72°F delay flower initiation in the poinsettia, even under short day conditions. Poinsettia growers are using the DIF concept to help control poinsettia height. Additionally, growers are finding the use of heat delay to be useful under circumstances where the crop is slow. In this situation, growing plants with day and night temperatures in the mid-to-upper 70's prevents flower initiation, even under inductive photoperiod conditions, while hastening vegetative growth.

Lily Modeling: The effects of temperature and photoperiod in promoting lily flower initiation have been quantified. The optimal temperature for lily flower initiation is 38 to 41°F. Long days are only effective in promoting flower initiation if the long days are preceded by a cold treatment. Leaf unfolding rate in the lily is a function of average daily temperature and flower bulb size. Leaf unfolding increases at the same temperature as the bulb size increases. Likewise, flower number, leaf number, and plant height all increase as bulb size increases. Time to flower from emergence decreases as bulb size increases.

Other Models: In related projects, the modeling approach is being applied to other crops. African violet and hibiscus are currently being modeled.

Grower Management Tools: Graphical tracking has been developed as an efficient and user friendly method of helping greenhouse growers precisely produce poinsettias, Easter lily and chrysanthemum to specific height specifications. The procedure allows application of DIF and growth regulator based on actual crop conditions rather than being based on a best guess. An increasing percentage of poinsettia and Easter lily crops in North America are being grown with graphical tracking.

Benefits: The benefits of this research to the floriculture industry are demonstrated daily. Some growers are beginning to adopt the use of subirrigation with recirculated solutions. Many more are looking for answers about how their current irrigation methods must be altered to reduce runoff. Growers around the country are adopting the DIF concept to regulate stem elongation. Crop models are providing important information to predict and control plant development. The use of temperature to regulate plant growth has increased dramatically this past year and the demands for new information are getting louder all the time.

how we can incorporate horticulture into grade schools/middle schools/high schools.

(4) A Short Course to be held in conjunction with the 1991 ASHS meeting at Penn State. This workshop will expose public school science teachers, 4-H leaders and FFA teachers to the use of video and computer technology to teach horticulture.

Dr. Lois Berg Stack, University of Maine, chaired the Workshop.

Education Projects Funded 1989

1. Future Farmers of America National Agricultural Career Show Booth – $2,000
2. Mosmiller Scholar Program (10 students) – $12,000
3. Intercollegiate Flower Judging Contest – $4,300
4. Support for the National Junior Horticultural Association – $500
5. Support for the American Horticultural Therapy Association – $500
6. Academic Advisor – $3,000
7. FFA Foundation Proficiency Award (1/4 sponsorship) – $4,500
8. FFA Foundation Floriculture Scholarship – $1,000
9. Support for the 2nd National Tomato Spotted Wilt Virus Conference – $2,000
10. ASHS Floriculture Education Group Workshop – $1,136

Special Projects

The Endowment policy continues to be to *emphasize the development of the Endowment.* However, in 1982, the Board determined that designated funds may be received to support projects approved by the Board for such funding.

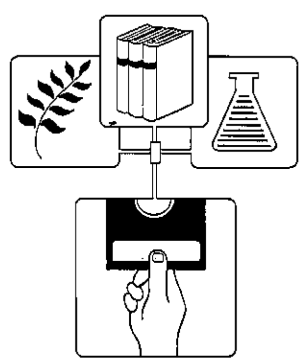
Two long term *designated funding* programs were established with cooperative agreements signed between the Endowment and the U.S. Department of Agriculture in 1984: *New Crops Development* at the Florist and Nursery Crops Laboratory and *A Centralized Research Information Data Base* at the National Agricultural Library.

New Crops

Sponsored jointly by the Society of American Florists (SAF), USDA and the Endowment, the program concluded its fifth year in mid-1989. A new 5-year contract was signed for 1989-1994. Supported financially in varying amounts by over 20 industry firms and organizations, SAF serves as industry liaison.

NAL Data Base

Dubbed The Floriculture Information Connection, work continues on developing this centralized research and education information data base at the Library. Two projects were completed in 1989: 1) publication of an annotated bibliography on marketing of floricultural products, and 2) an ongoing documentation and reporting system for Endowment-sponsored research and education grants awarded since its inception in 1961. Initial funding for the program was provided by 5 industry firms and organizations. The Endowment serves as industry liaison.



Total Grants 1961-1989

Research Grants 1961-1989

University of Arizona	$7,200
University of California, Davis	155,865
University of California, Riverside	261,680
Clemson University	9,250
Colorado State University	76,800
University of Connecticut	109,841
Cornell University	157,410
Ernst & Young	104,600
University of Florida	158,100
The Florida Agricultural Research and Education Center	65,500
University of Hawaii	10,500
University of Illinois	36,500
Kansas State University	26,000
University of Massachusetts	10,200
Meyer Manhattan Psychiatric Hospital	1,500
Michigan State University	208,300
University of Minnesota	58,600
North Carolina State University	28,500
The Ohio State University	110,000
The Ohio Agricultural Research and Development Center	69,500
The Pennsylvania State University	113,042
Purdue University	16,500
Rutgers	9,000
Society of American Florists	66,500
Texas A&M University	9,250
United States Department of Agriculture	347,500
•Florists & Nursery Crops Lab (297,500)	
•National Agricultural Library (50,000)	
Virginia Polytechnic Institute & State University	37,500
Washington State University	11,200
University of Wisconsin	22,700
University of Wisconsin Medical College	15,000
WF&FSA	2,500
Total Research Grants	$2,316,538

Education Grants 1961-1989

Academic Advisors for SAF Research Committee and Endowment	$42,000
American Horticultural Therapy Assn.	3,500
ASHS Symposium	500
ASHS Floricultural Education Group Workshop	1,136
DuPage Horticultural School Loan Fund	20,000
FFA Convention Booth	11,700
FFA Floriculture Scholarship	3,000
FFA Floriculture Proficiency Award	13,500
Intercollegiate Flower Judging Contest	30,000
International Energy Conference – Ohio	4,000
Kiplinger Chair Publications	11,500
Mechanization Exploration Trip to Holland	1,000
Mosmiller Scholar Program	106,000
National 4-H Council	10,000
National Junior Horticulture Assn.	4,000
Profile objectives/guidelines for modeling	5,000
Publication ISHS Floricultural Workshop Paper	850
Sabbatical Leave Grants (8)	46,250
Smithsonian Institution	25,000
Society of American Florists	58,749
Tomato Spotted Wilt Virus/ Western Flower Thrips Symposium (2)	12,000
Total Education Grants:	$409,685

Total Research and Education Grants 1961-1989 $2,726,223

Mosmiller Scholar Program

More than 170 students have become Mosmiller Scholars through this Endowment sponsored combination internship-scholarship program. Those successfully completing a minimum 10 week paid training experience after placement with a selected industry firm receive $1200.

The main thrust of the program is to attract motivated, qualified university students to the floral industry. Up to 10 students may be sponsored annually. The following eight successfully completed a training experience during 1989.

1989 Mosmiller Scholars

Karen E. Bryant
Cornell University
Trained: Royer's Flowers, Inc.
Lebanon, Pennsylvania

Julie Ann Cole
Southern Illinois University, Carbondale
Trained: Applewood, The C.S. Mott Estate
Flint, Michigan

Patricia J. Duggan
The Ohio State University
Trained: 'tBloemenwinkeltje and Tuincentrum
Aalsmeer, The Netherlands

Robin Lynn Fruth
University of Wisconsin-River Falls
Trained: Sargent's on 2nd
Rochester, Minnesota

Michelle D. Graham
Texas A&M University
Trained: Amelia Island Plantation
Amelia Island, Florida

Gwendolyn Hartley
University of Kentucky
Trained: Yoder Brothers, Inc.
Alva, Florida

Hesper L. Slater
University of Missouri
Trained: Tropical Plant Rentals
Kansas City, Missouri

Krisanne Woodward
The Pennsylvania State University
Trained: Tropical Plant Rentals
Atlanta, Georgia


Karen E. Bryant


Julie Ann Cole


Patricia J. Duggan

picture unavailable
Robin Lynn Fruth


Michelle D. Graham


Gwendolyn Hartley


Hesper L. Slater


Krisanne Woodward