

North Carolina

# Flower



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# Growers Bulletin

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## Floriculture Programs at North Carolina State University

Many readers of the Bulletin have never visited the North Carolina State University campus. Their major knowledge about the university probably has something to do with athletics, as some of the teams have captured a headline or two. Readers from North Carolina are aware that the campus is located in Raleigh, but many out-of-state people confuse this institution with one established in Orange County, and the two are really quite distinct.

This issue will contain several pages of information about the floriculture programs here. The publicity is not intended to be boastful, but rather to acquaint people with what we are doing or hope to do. All of us in the program appreciate the facilities we have available to us, and project leaders enjoy their good fortunes in having excellent support personnel. Financial and moral support from the floriculture industry and from university administrators have made many improvements possible. The N. C. Commercial Flower Growers' Association has given good financial support with no demands attached, and that generosity and spirit is publicly applauded.

**THE DEPARTMENT OF HORTICULTURAL SCIENCE.** There are 19 departments in the School of Agriculture and Life Sciences. The department, consisting of people working with tree and small fruits, vegetable crops, woody ornamentals, landscape horticulture, post-harvest physiology and floriculture, has more faculty members in one administrative unit than any other horticulture department in the country (47 faculty). Five faculty members are floriculturists. Their programs are described later in this article. Personnel from some other departments in the School of Agriculture and Life Sciences provide major contributions to commercial floriculture, and such activities also are discussed later.

**FACILITIES.** Visitors on the campus for the first time are usually surprised at our facilities. They thought we only had a basketball court, and then they see 27,000 square feet of greenhouse space, just behind Kilgore Hall, our department office, laboratory and classroom building (at the intersection of Brooks Avenue and Hillsborough Street). The greenhouse has 22 compartments, and 8 of those compartments are assigned to floriculture. The conservatory also is used by floriculture classes and is one of the most popular "tourist" attractions on campus. The Phytotron is within a 2-minute walk from the greenhouses and is frequently used in floriculture research. Dr. R.J. Downs, director of the Phytotron, is

(continued on page 2)

**Floriculture Programs at NCSU**—(continued from page 1)

well acquainted with floricultural crops and very supportive of our research. Plant pathology, entomology and botany departments are located in Gardner Hall, next door to our greenhouses and surrounding the Phytotron.

Joe Love's bedding plant trials are conducted at our "Method" station (Research Unit #4), and that's a 5-minute drive from campus. The azalea cooler and a 21'x100' plastic greenhouse also are located there.

The D.H. Hill Library continues to acquire references pertaining to floriculture and allied subjects, and an effective inter-library loan system provides access to almost any printed matter one might desire to read. Computerized literature retrieval systems are part of the library services. "Computerized" is a key word in any 1984 publication, and N.C. State University and computers are closely linked. It was the pioneering work of the late Dr. Gertrude Cox (an orchid enthusiast and investor in a successful greenhouse venture) and her colleagues in the statistics department who did much to entice the computer industry to the Research Triangle. Expertise on computers is readily available. By the end of this summer there will be 3 computers in the floriculture programs here, with access to numerous other units and software. Bill Fonteno and Paul Nelson will have computer programs and "hands on" experiences in their greenhouse management courses this Fall.

**TEACHING.** Teaching has a top priority and there are floriculture curricula in both the 2-year and 4-year undergraduate programs. Most of the undergraduate students are North Carolinians but a fair percentage come from neighboring states. Estimated annual undergraduate expenses, listed in the 1983-85 catalog, are:

	<u>1st Semester</u>	<u>2nd Semester</u>	<u>Year</u>
Tuition and Fees			
a) N.C. Residents	\$ 341	\$ 341	\$ 682
b) Out-of-State Residents	1,253	1,253	2,506
Room Rent	500	500	1,000
Meals	600	600	1,200
Books and Supplies	150	150	300
Other Personal Expenses	325	325	650
<b>TOTAL</b>			
a) N.C. Residents	\$1,916	\$1,916	\$3,832
b) Out-of-State Residents	2,828	2,828	5,656

A footnote states that all charges are subject to change without notice. The Admissions office was contacted on July 30, 1984 and tuition and fees have gone up. N.C. residents have a tuition and fee charge of \$398 per semester (\$796 per year) and out-of-state residents must pay \$1708 per semester (\$3416 per year). These rates are effective in the Fall semester, 1984.

Floriculture students are advised to participate in external learning experiences, and this summer students have been employed in several areas of the United States. Students, in previous summers, have worked in Sweden, The Netherlands, France and England.

Graduate students have vital roles in the research, teaching and extension missions in floriculture. Numbers of graduate students vary considerably from year to year, generally depending on availability of assistantships. Graduate students who will be enrolled in our department, with majors in floriculture, will be shown later in this article.

(continued on page 3)

**Floriculture Programs at NCSU**—(continued from page 2)

**PERSONNEL.** Each project leader involved in floriculture at North Carolina State University has been invited to briefly describe teaching, research and extension programs. Telephone numbers and addresses are listed by each project, should readers desire further information.

**James R. Baker.** Education and research programs on insects affecting floricultural and nursery crops are my responsibility. I am assisted by Phyllis S. Lamont, Extension Agricultural Technician I. Facilities available to me include a 24'x60' polyethylene covered quonset greenhouse near the corner of Western Boulevard and Gorman Street in Raleigh and outdoor plant beds at the Unit 2 Research Farm at the southern edge of Raleigh. These plant beds are on trickle irrigation. (If you are running low on mealybugs or aphids, feel free to stop by and replenish your supply).

One third of our extension time is devoted to floral crops. My time is divided among (1) training county extension agents to respond to requests from amateur horticulturists, (2) responding to requests from amateur horticulturists, (3) responding to requests for information from professional growers, (4) training county extension agents to respond to requests from professional growers, (5) preparing educational materials for the North Carolina Flower Growers' Bulletin and Ornamental and Turf Insect Notes, (6) participating in local flower grower association programs, (7) participating in the North Carolina Flower Growers' short course. Phyllis Lamont's time is spent maintaining the greenhouse and Unit 2 facilities, plant maintenance and propagation, setting up tests, recording data, and many other miscellaneous but extremely helpful responsibilities.

I devote approximately 10% of my time to research on insect pest management of floral crops. Research is involved primarily with screening new insecticides and new formulations for efficacy and for phytotoxicity. Current research involves aphid, whitefly, spider mite, hemispherical scale and broad mite control on chrysanthemums, bedding plants and foliage plants by pyrethroids.

I can be contacted at 919-737-3140 or Department of Entomology, Box 7613, NCSU, Raleigh, NC 27695-7613.

**A.A. (Gus) De Hertogh.** The headship of the Department of Horticultural Science at North Carolina State University is a full-time administrative position but Gus De Hertogh still maintains a strong interest in flower bulb technology. This past spring he supervised trials on many bulb crops, verifying information which will appear in a new handbook. Amaryllis, hybrid lilies, freesias, canna lilies, tulips, narcissus, hyacinths, caladiums, dahlias were just a few of the "bulbous" crops he evaluated.

Problem bulbs from around the country find their way to Gus' desk and he seems to thoroughly welcome such diversions. He still is frequently invited to give talks at short courses, as he remains well informed about research in the production of bulbous crops.

His official teaching responsibility in the department is an undergraduate seminar, but he is readily accessible to students seeking information on bulbous crops or research techniques.

Gus is presently on off-campus scholarly leave, working with bulbs in Lisse, The Netherlands.

Gus' office at N.C. State University is 118 Kilgore Hall, and phone number is 919-737-3131.

(continued on page 4)

**Floriculture Programs at NCSU**—(continued from page 3)

**William C. Fonteno.** My technician, Paul Karlovich, and I are studying the physical properties of container media for floricultural crops. I think there is more confusion about greenhouse media now than ever before. Growers have greater choices of mixes and formulations, but seem reluctant to use some of them. Why? Essentially it is because, although we have more mixes available, we do not know any more about the air and moisture relationships today than we did 10 years ago. We are trying to tackle the real issues of media with a more classical soil physics approach. The first step we are taking is to accurately determine the air and moisture relationships of container media. The second step is to determine the ranges of these parameters for production conditions. The third step is to develop mathematical models so we can accurately predict air and moisture values to aid growers and media manufacturers in media formulation. One of our goals was to create models for any size or shape of container, and models now exist for containers ranging in size from 3 gallon nursery containers to "waffle plugs".

I teach 2 floriculture courses in the Agricultural Institute Program and the introductory horticulture course in the 4-year curriculum, and assist floriculture graduate students in the development of computer programs.

My office is 152 Kilgore Hall, and I can be reached at 919-737-3133.

**Ronald K. Jones.** My responsibilities are 85% extension and 15% research on diseases of floral crops, woody ornamentals, shade trees, Christmas trees, landscape plants, blueberries, strawberries, brambles, and grapes. A major responsibility is supervision of the Plant Disease and Insect Clinic.

The Plant Disease and Insect Clinic is a joint effort by the Departments of Entomology and Plant Pathology. For the past several years, the Clinic has been receiving approximately 8,000 samples each year. About 5,000 of these samples have disease, physiological or environmental problems. The number of samples had been increasing steadily. The extended dry weather during 1983 has probably limited this growth. Approximately one-half of the samples are ornamentals, turf and shade trees.

The Clinic is an integral part of our total Extension program. Since approximately 80% of the samples are submitted through our county extension agents, we consider the Clinic as one of our most important agent training tools. It is also our major program directed toward the general public.

The Clinic is supported financially by Extension. Plant Pathology has one full-time technician and one half-time secretary in the Clinic plus one full-time student during the summer months. The Entomology Department has one full-time extension specialist in the Clinic to identify the insects.

Diagnoses are made by both research and extension plant pathologists. Various faculty members with expertise on specific crops assist in the Clinic. Nematode assays are performed in Dr. Ken Barker's laboratory. Virus assays are performed by Drs. Gooding, Hebert or Moyer. Dr. Grand assists with difficult fungal identifications.

The Clinic is in 1300 Gardner Hall. My office is 1405 Gardner Hall, and telephone number is 919-737-2711.

**Roy A. Larson.** At N. C. State University since 1961, I have been involved in research on the use of growth regulators and environmental control to regulate growth and flowering. Visits to the greenhouse sections assigned to me would

(continued on page 5)

**Floriculture Programs at NCSU**—(continued from page 4)

reveal a wide assortment of floricultural crops in the 2 floriculture courses I teach, and research studies on crops such as poinsettias, azaleas, chrysanthemums, and Easter lilies. "Plug" research is getting attention now, and one greenhouse section has been renovated for these studies. Transite benches have been replaced by movable expanded metal benches, equipped with Biotherm bottom heat (4 temperature zones are possible within this section). An automatic irrigator can easily and uniformly apply water to seedlings and cuttings being grown on the benches.

We have a cooperative study underway with Dr. David Hartley of Paul Ecke Poinsettias, and we are seeking more information on the interaction of temperature and daylength on flower bud initiation and development. Much of the research is being done in the Phytotron under precisely controlled conditions, but several benches of greenhouse space also are involved. We also are working with Terril Nell and his graduate student, Anne Whealy, from the University of Florida, on heat delay of chrysanthemums.

I have been fortunate since I arrived in Raleigh to have very competent technicians. Martin McIntyre and Bobby Hilliard added much to the chances for success of the program when they worked for me, and Beth Thorne is doing an outstanding job. She is much more "computer literate" than I am, and she is combining that knowledge with her strong interest in plants. She also works very closely with the graduate students and supervises student employees. The impact of graduate students on my floriculture program cannot be overemphasized, as fresh, industrious graduate students do keep aging advisors active, trying to catch up on research techniques.

My job description now is 50% teaching and 50% research. I teach 2 floriculture courses in the 4-year program, one each semester. My office is 128 Kilgore Hall, and the phone number is 919-737-3132.

**Joseph W. Love.** The North Carolina floricultural extension duties are my responsibility. The floricultural industry is represented in practically all parts of the state with the largest concentration of greenhouses located in the Piedmont and Western counties. The majority of the firms are small, family units. However, there are several large ranges located in the state.

My duties involve assisting county extension agents to conduct educational programs, as well as to assist in solving grower cultural problems; county extension agents are assisted in solving home-owner floricultural problems; to coordinate annual meetings such as the annual short course, holiday plant day and bedding plant field day; to help growers make management decisions, to prepare fact sheets and other cultural practice publications, and to transfer information generated from NCSU floricultural research. Currently, plans are underway to divide the state into districts so that regional educational programs can be offered on a regular basis.

New bedding plant varieties are received from the major plant breeders and brokerage firms for evaluation at the Unit 4 farm in Raleigh. Applied-type research is conducted in Raleigh and in cooperation with commercial growers. Emphasis has been placed on such species as African violet, Fuchsia, Kalanchoe, Christmas cactus, poinsettia and New Guinea impatiens. Much of this work has involved studies with growth regulators, growing media, plant nutrition and environmental factors.

I have coached the North Carolina State University flower judging team for approximately 20 years.

(continued on page 6)

**Floriculture Programs at NCSU**—(continued from page 5)

Bernadette Scott, a graduate of floriculture and pest management at NCSU, assists me with the floricultural extension duties. My office is located at 124 Kilgore Hall and telephone number is 919-737-3322 (work) and 919-851-0577 (home).

**Paul V. Nelson.** My past at NCSU goes back 19 years when I assumed a floricultural position with responsibilities equally divided between teaching and research. Over the years I have been responsible for teaching greenhouse operations in the two year Agricultural Institute curriculum and Plant Nutrition in our graduate student program. Other courses taught at various times have included plant propagation, and flower crop production. As an outgrowth to the greenhouse operations course I wrote a textbook, Greenhouse Operations and Management, in 1978. The third edition of this book has been completed and will appear in January, 1985.

The main thrust of my research program has always been plant nutrition. Over the years subjects addressed have included slow-release fertilization, nutrition programs for Rieger begonia, kalanchoe, and spring flowering bulbs, copper deficiency of chrysanthemums and roses, ammonium toxicity of chrysanthemums and gloxinias, boron toxicity of begonias, micronutrient fertilization, foliar fertilization, and development of foliar analysis standards for several crops. Additional research topics included the mode of action of the chemical pinching agent Off-Shoot-O and an economic analysis of the costs of producing and marketing floral crops. Currently we are investigating methods of increasing the efficiency of fertilizer application in the greenhouse.

My office is 126 Kilgore Hall, and telephone number is 919-737-3132.

**David L. Strider.** My primary responsibility is research on disease control for floral crops and bedding plants for North Carolina growers. I rely on growers, the Plant Disease and Insect Clinic, personal surveys of the industry, and a continuing search of pertinent literature to determine which diseases should be investigated to provide better disease control. Recently, considerable time has been devoted to chrysanthemum Fusarium wilt and bacterial soft rot, exacum botrytis blight, and marigold bacterial spot and bacterial wilt. Other diseases currently under study include damping-off of several crops, Easter lily root rot, oxalis rust, rose powdery mildew and black spot, and snapdragon rust. Results are presented at scientific and grower meetings and are published in professional and trade journals, including this Bulletin. I am assisted by Nancy House in both the greenhouse and laboratory phases of our research.

I have recently edited two books on diseases of floral crops which will be published by Praeger Scientific (521 Fifth Avenue, New York, NY 10175). One volume will treat the general groups of diseases, causal agents and disease control measures; the second volume will describe specific diseases and their control for many major floral crops and bedding plants. Leading authorities from throughout the United States have contributed chapters to these volumes.

Teaching at both the undergraduate and graduate levels is another important aspect of my work. Currently I am responsible for PP 313, 'Diseases of Floral Crops', and share the responsibility for PP 055, 'Diseases of Ornamentals and Turfgrasses'. In both courses I emphasize detection and diagnosis of floral crop diseases, recognition of causal agents, and application of effective economical control measures. I also serve as advisor to undergraduate and graduate students.

My office is 3411 Gardner Hall, and telephone number is 919-737-2751.

**Ray Tucker.** Ray's picture appeared in the October issue of the Bulletin, along with his article about soluble salts. Ray is an agronomist with the N.C. Department

(continued on page 7)

**Floriculture Programs at NCSU**—(continued from page 6)

of Agriculture. Soil and foliar samples are analyzed by the NCDA, but a close relationship has long existed between NCSU floriculture personnel and the people in Agronomic Services at the Blue Ridge Road Office Center in Raleigh (919-733-2655). Growers in the state are fortunate to have such laboratory facilities and personnel available to them. Soil sample boxes and foliar analysis envelopes can be obtained at county extension offices. There is no charge for soil testing, and \$3 per sample for foliar analysis, for state residents.

**Dan Willits.** I am an associate professor in the Department of Biological and Agricultural Engineering. My responsibilities are divided between research (80%) and teaching (20%). The research is devoted primarily to the study of greenhouse environment and its control.

Research projects now under my supervision include the use of rock storages as energy saving devices, the development of techniques to enrich greenhouses with CO<sub>2</sub> in the southern U.S., the development of rational models for understanding and predicting greenhouse environment, and the use of computers for environmental control. The research facilities included eight fully instrumented, computer-controlled greenhouses located at University Research Unit #4 on Beryl Road (Method Station). Visitors are welcome.

My office is in 180 Weaver Laboratories, and my phone number is 919-737-3121.

**The Secretaries.** The people you are most likely to speak to first if you call researchers, teachers and extension specialists are the secretaries. The people you are most likely to meet first if you come to our office buildings to visit are the secretaries. They have vital roles in the successful execution of our assignments. Emily Tate is secretary for Roy Larson, Paul Nelson, and 4 other faculty members in the Department of Horticultural Science. She also types the articles for the N.C. Flower Growers' Bulletin. (The Association recently contributed money towards the purchase of a very sophisticated typewriter used by Emily). Barbara Brown is the secretary for Bill Fonteno and 5 other faculty members. Joe Love's secretary is Saranda McNeill, who also is secretary for 3 other extension specialists.

Barbara and Emily are in Room 132 Kilgore Hall and Saranda is in Room 162A.



Floriculture secretaries. Left to right, Emily Tate, Saranda McNeill, and Barbara Brown.

(continued on page 8)

**Floriculture Programs at NCSU**—(continued from page 7)

**The Greenhouse Staff.** A capable, experienced greenhouse staff would be appreciated by anyone in the greenhouse business, commercial or academic, and we are fortunate to have a very competent staff. J.C. Taylor, Jr. has been our greenhouse superintendent for a quarter of a century. David Arrington is the assistant superintendent, and Donny Manshack and Mark Hardy are responsible for the daily care of plants. Four undergraduate students reside in the headhouse, and are responsible for night temperature control and weekend watering.

**The Method Staff.** John Scott is superintendent of Unit 4, our Method Farm, and is assisted by Clifton Ryan. They are responsible for a vast assortment of horticultural crops, in research, teaching, and extension programs. New facilities have been constructed at Method, such as a large lath house, media storage building, and several plastic greenhouses.



A. A. De Hertogh, Department head



Paul Karlovich and William Fonteno



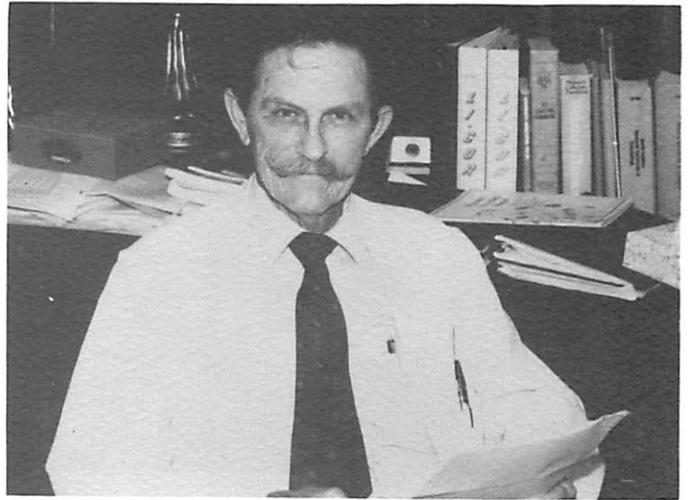
Beth Thorne and Roy Larson



Bernadette Scott and Joe Love



Paul Nelson



R. "Jack" Downs



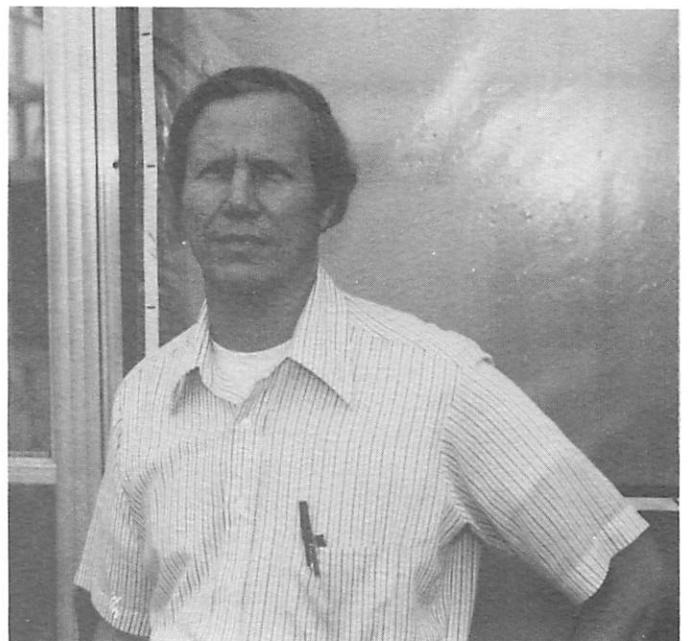
Phyllis Lamont and Jim Baker



Ron Jones and the Plant Disease and Insect Clinic staff. Left to right: Dot Duke, secretary; Alice Hisada, David Stephan, and Ron Jones



Dave Strider and Nancy House



Dan Willits



John Brown, Yvonne Isenberg and Robert Milks, floriculture graduate students.



The departmental greenhouse staff: J. C. Taylor, Jr., superintendent; Mark Hardy, David Arrington, Donny Manshack.



Clifton Ryan and John Scott, superintendent, Research Unit #4, better known to us as the "Method" station.