

Many of these plants have a very limited range, and as the undeveloped areas of our state fall to the bulldozer and the dragline and dredge, some of these habitats will be lost. The setting aside of large areas as parks and "wilderness areas" is good, but it cannot guarantee to preserve all of the very limited habitat of some species.

Preserving over a million acres that constitute Everglades National Park didn't prevent Hurricane Donna (1960) from wiping out the entire wild population of *Reddish Peperomia* (*Peperomia humilis* Vahl.) when salt water covered the buttonwood-mangrove community that was its only known habitat. Only the fact that it was in limited

cultivation kept it from extinction. On North Key Largo, the only hammock known to harbor *Acacia Choriophylla* burned over and it probably is no longer found in the wild. Fortunately it too had been propagated, thus not lost completely.

There are many other examples of endangered species that lend themselves to cultivation. Shouldn't horticulturists learn to use, and thus perpetuate these native plants with all the enthusiasm that is shown those brought in from some far flung corner of the world?

We sincerely believe so.

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LEARNING BY DOING

The Work/Study Program for Ornamental Horticulture Students at the University of Florida

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Abstract. Ornamental Horticulture students at the University of Florida may earn up to four academic credits for full time practical work experience. This report describes the program, lists the guidelines followed, relates how the program developed, gives a profile of participating students, compares other work/study programs, and lists benefits to students, employers, and the Ornamental Horticulture Department.

A new "work-study" program is receiving increasing attention in the Ornamental Horticulture curriculum at the University of Florida. A student may leave the classroom routine for one or two academic quarters and work as a regular employee for a cooperating firm. The student earns not only his wages, but can get up to four college credits in the supervised program. Unlike many part-time jobs, a student gets a solid taste of everyday work in his chosen area of study.

Description and Guidelines

Approval was granted to make the program possible only a couple a years ago.

The program is now listed in the college catalog as OH 400, Full-Time Practical Work Experience in Ornamental Horticulture (OH). Prerequisites for granting of credit are prior arrangement with the employer for the work experience; and approval by the student's advisor, the OH Department Chairman, and the Dean of the Agriculture College. Credit is earned at the rate of one credit per month of full-time work, not to exceed four credits, employment must be supervised practical work in an area of ornamental horticulture relevant to the student's college program. The student must submit a formal report. Grading is on a S-U basis (satisfactory-unsatisfactory).

The Dean of the Agricultural College has set guidelines to insure maximum benefit from the program and to uphold the integrity of college credits issued for non-classroom activity. The guidelines can be summarized as follows:

1. Application by the student for credit for practical work experience must be approved before the term of employment begins. This avoids potential abuses and helps maintain control.

2. It is the responsibility of the student to make all arrangements with the employer regarding pay, working hours, benefits, and to provide his own transportation, housing, etc.

3. Agreements among student, OH Department, and employer must be established before approval is granted, to insure educational objectives for college credit can be fulfilled. Every effort must be made by all parties to create a learning experience.

4. Practical work must be a NEW experience for the student and must be directly related to his field of study. It is unlikely that approval would be granted for a job a student has held the last two summers.

5. No approval shall be granted for a person working on his home enterprise or a family related operation.

6. On-site visits by a representative of the OH Department are desirable to evaluate the student's work with his immediate supervisor and to ascertain whether educational objectives are being met. Timing and number of visits will depend on individual circumstances. If the cooperator and his work program is not well known to the OH Department, a visit prior to assignment of a student is advised.

7. The student is an employee of the cooperator and as such may be fired if his performance is unsatisfactory.

8. The employer is responsible for all liability for the student as for any other employee (the University of Florida will have no liability to the student during the term of employment); and to furnish beneficial work experience to the student in accordance with the guidelines of this program.

9. The OH Department is responsible for helping the student contact cooperating employers and planning an individual program, to assist co-operators as needed in the conduct of a program, to assure proper evaluation of the student, and to offer guidance as required until the final report is submitted.

In short, students must work for employers as if they were regular employees but must be exposed to as varied experience as possible. In addition, the student must take notes and write a formal report to satisfy requirements for credit. Reports follow a general format covering description and evaluation of physical plant, personnel, operations, service or production practices, and marketing. The student is encouraged to analyze what was learned on the job and

compare it to what was learned in class, assuming completion of courses covering the subject matter in question. Students register for credit after the fact, as it were, often accomplishing this through routine drop/add procedures the first week of classes. They pay the same tuition fees as any other junior-senior level course. Reports are due one month after returning to classes, and are reviewed both within the OH Department and the Dean of Agriculture's Office prior to assignment of grades. As a courtesy to co-operators, the OH Department has been furnishing them with a copy of the report after the student is assigned a grade. Reports are usually quite objective and co-operators have remarked that they provide a look at their operation through a fresh set of eyes. The OH 400 advisor retains the privilege of editing reports prior to release to protect the objectivity of the student, however, this is seldom necessary.

History and Development of the Program

The first 3 students entered the "pilot phase" of the program during the summer session 1975, and one each during the fall, winter, and spring quarters. All had favorable work experiences and news began to spread in our student body. The real interest was sparked by a program presented to the Ornamental Horticulture Club March 3, 1976 about Employment Opportunities in OH. Speaker after speaker emphasized the need for experience and urged students to get part-time or summer jobs in industry and take advantage of work/study programs. Shortly thereafter, students began to beat a path to the OH 400 advisor's door. Within 3 weeks, 21 students were on the waiting list—in another month 34 students had applied and were counseled on the program. Three soon cancelled because of changes in summer plans, 3 were rejected because part-time work was ineligible, and 3 were unable to find a job near their home and could not move elsewhere.

In an effort to obtain industry support and employment for the applicants, an article was written explaining the program. Copies were sent to the Florida Turf Grass Association, The Florida Nurserymen & Growers Association (FNGA), the Florida Flower Association and every chapter of FNGA. County agents were alerted, as were editors of Florida trade publications and newsletters. *Florida Turf* and the two extension newsletters, the *Florida Flower Grower* and the *Florida Foliage Grower*, published articles shortly before classes ended in June. Earlier, copies of the article and letters requesting cooperation were mailed to several dozen selected growers, and to some of the larger botanic gardens and public gardens in the Southeast. Best response was obtained from this mailing. Then came the task of matching student with employer, which continued past the time finals ended and into early summer session. Most students relied on the advisor for contacts and made personal visits to secure a job and negotiate wages, etc. Finally, 27 students were placed in the following organizations:

- 1—Alberts & Merkel, Boynton Beach
- 1—AREC-Homestead, special project
- 2—Bellingrath Gardens, Mobile, Alabama
- 1—Citrus Black Fly Program, Division of Plant Industry, Plantation
- 1—Cypress Creek Nursery, Windermere
- 1—Earl J. Small Growers, Inc., Pinellas Park
- 1—Exotic Gardens, Davie
- 1—Gardens, Inc., Miami
- 2—Jones & Scully, Inc., Miami
- 1—Kraft Gardens, Deerfield Beach
- 1—Kelsey City Landscape & Nurseries, Inc., Lake Park
- 2—Loop's Nursery & Greenhouses, Inc., Flower Division, Jacksonville

- 1—Loop's Nursery & Greenhouses, Inc., Foliage Division, Jacksonville
- 3—Manatee Foliage Division of Manatee Fruit Co., Cortez
- 1—MLH Growers, Lantana
- 1—Nobles Greenhouses, Lantana
- 1—Ornamental Horticulture Dept., Gainesville, special project
- 1—Toad Suck Farm, Del Ray Beach
- 1—Tree House Plants, Apopka
- 1—Vosters Nursery & Greenhouses, Miami
- 1—Winter Haven Nursery, Winter Haven
- 1—Woodlands Golf & Country Club, Ft. Lauderdale

Several other firms responded but we were unable to find enough students willing to stand the expense of living away from home.

Profile of OH 400 Students

In order to quantify and describe the background and attitudes of the OH 400 students, a sample group of students was asked to respond to a series of questions upon their return to classes this fall.

Eight percent were brought up on a farm, 23% in small towns, 38% in large towns, and 38% in cities. Only 15% said any member of their family worked in an agricultural or horticultural occupation, thus it is not surprising that only 15% were in 4-H or similar agricultural youth clubs.

Seventy percent had never been employed in an ornamental horticulture type job before, but they were no strangers to work. Ninety-two percent had had 5 or more full-time or part-time jobs on their record.

The majority of students had grown up where they and their family were involved with the care of lawns, landscape plantings, house plants, vegetable gardens, etc., and nearly one fourth had a greenhouse or other plant growing structure. Most did not become aware of ornamental horticulture as a career possibility until after they entered college. Upon graduation, two thirds expected to get a job in the industry, while others were considering employment in various county, state, and federal agencies. One fourth eventually wanted to start their own business. Expectations for starting salaries after graduation ranged from eight to fourteen thousand dollars per year, with the average about \$9500. These young people were ambitious and in five years expected to make \$14,800/yr.

When asked what they thought employers should realistically pay a student working on the OH 400 program, the average estimate was \$2.75 to \$3.50/hr. When we compared this with what they actually received, we found the range to be \$2.00 to \$3.90/hr, with the average \$2.75. Thus, students were approaching their financial expectations in average cases.

Over half the students found jobs or were placed in jobs that allowed them to live at home and save money for college expenses. Of those that lived away from home, the average housing cost was \$80/mo. This was lower than expected because of several cases of apartment sharing. Food costs average \$71.50/mo which was also low for the same reasons, and transportation costs were \$52/mo. Students are assessed \$16.50/credit hour for the course, so these four items cost the students \$220/mo not counting clothing, insurance, and miscellaneous expenses. We estimate that if take home pay was diminished by 20% due to Social Security, Federal Income Tax, and other deductions, the average student worked 2 1/2 weeks to pay minimal living expenses for the month. Few savings are left over. This causes a problem—not all students live within driving distance of a cooperating employer.

Recognizing this, Mr. Lou Clark of Loop's Nursery & Greenhouses in Jacksonville has personally funded a \$300

annual award in support of OH 400 students working in floriculture. The OH Department would welcome similar grants or awards from other segments of the industry, firms, or individuals. A viable tax deductible avenue exists through the SHARE program (Self Help for Agriculture Research & Education) of the University of Florida Foundation.

Half the students thought the course should be a required part of the OH curriculum. Those who did not think so qualified their answers: "No, but should be well advertised as an advantage to future jobs". "No, those with initiative will sign up anyway". "No, requirement might place undue hardship on some students". "No, but I think it is a most important course". Two thought it should not be required, but should be a recommended elective.

Students learned as much or more about labor and management practices as they did about horticultural practices. In some cases, this changed their minds about the future. Three fourths said the experience affected their career plans, with comments as follows: "May try to work for the state—feel inadequate handling laborers." "Am now more interested in floriculture than foliage". "Will not seek employment with large scale growers." "Helped me understand what was involved in the container nursery business." "I worked out of my field and reinforced my original goal in turf management." "Raised my goals to more than just 'taking care of plants'." "Reassured me of my choice of major." "Reinforced my desire to work with exotics." "May go to graduate school now."

When asked what improvements could be made in the program, most comments centered on impressing employers, managers, and supervisors on the need to be on-the-job teachers; and to expose the students to a wide variety of jobs. But the most interesting response was: "None, really. It's up to us. If we don't produce, it's our fault."

Indeed, it was up to them and they did produce. Almost without exception they received satisfactory or outstanding evaluations from their employer. Only three individuals washed out. One was hospitalized from an off-the-job accident, one felt he had to take a better paying job in order to stay in school, and one had a difference of opinion with his boss.

The employer was encouraged to assign the student to a wide variety of tasks. To emphasize this, a list of tasks was developed for each type of ornamental horticultural operation (greenhouse, container nursery, turf maintenance, etc.). Indeed, the task list could be tailor-made to fit a particular operation during the planning phase of a program. It then became easy for the student and/or his supervisor to keep a record of the tasks performed. In addition, the student was expected to keep a daily log of his activities and attach it to the final report. Since the task lists developed so far are rather general and comprehensive, it has not been necessary to have every single task checked off. If an employer had to distort his normal operations on that account, the OH 400 program would have been a failure. We desired a student be shifted around to get an exposure to a variety of jobs.

We expected the employer or supervisor to act as an on-the-job teacher by answering questions and explaining things as they were done. Some did this as the occasion arose, while others were more organized and set aside a few minutes each week to review the student's work, answer questions, and explain operations. Some preferred to present the student with a real problem that had come up and asked him to solve it. Any way it was handled, the ideal situation was when the student got an informal education, based on the employer's or supervisor's experience.

Aside from the time spent in informal education, there was very little else required on the employer's part except an

evaluation. This was done either when the departmental representative visited, or near the end of the employment period. The same form used for Career Service Employees at the University was provided. It took about five minutes to fill out, including the remarks section. This was attached to the student's final report.

Comparison with Other Programs

Work/study programs are not a new idea. For years Cornell has required students in ornamental horticulture and floriculture to have work experience prior to graduation. Purdue now has a similar requirement and the student's employer must certify the fact of the student's employment in writing. Ohio State University (OSU) has an internship program. The University of Minnesota (UM) has a Professional Experience Program and students must turn in a final report. Washington State University (WSU) offers up to 8 credits in their Professional Work Experience. OSU, UM, and WSU have developed memoranda of agreement to be signed by the employer, student, and faculty advisor specifying the employment period, wages, overtime, outline of specific jobs the student will be required to do, and generally state two weeks notice is required by any party for termination of the agreement. Rutgers University has a "work/learn program" in cooperative education that may be used by horticulture students. Oregon State has had a work/study program for about two years. There may be others, but these have come to our attention since the OH Department became involved in this program.

A few nurseries and gardens have been noted for their summer work and training programs in ornamental horticulture, notably, Monrovia Nursery Co., Azusa, CA; Oki Nursery, Sacramento, CA, and Longwood Gardens, Kennett Square, PA. These were open to applicants from all over the country and acceptance was considered a prize and an honor. But openings were limited. More recently, Ecke Poinsettias, Encinitas, CA has initiated a summer employment program and last summer employed 55 horticulture students.

The Society of American Florists operates the Mosmiller Scholar program, awarding grants to 8 floriculture students every 6 months to work in participating SAF firms. The main weakness of these limited programs is that few students benefit nationwide. Enrollments in ornamental horticulture have been rising at astounding rates. The OH student body at UF has increased from 12 juniors and seniors in 1966 to 165 in 1976. Similar increases have occurred at all institutions with horticulture curricula.

This rising enrollment is a matter of concern in academic circles. Horticulture faculties are urged by Dr. J. Benton Storey (1), "to encourage more of our students from urban areas, who usually have no experience, to take advantage of work/study programs, summer employment, and other temporary job opportunities in horticulture so they can qualify for positions where the employer cannot or will not provide an initial training program. It becomes more important that horticultural graduates have the necessary work experience in addition to basic knowledge before taking a management position. The student who takes a common labor position that will provide experience in horticulture will be in much greater demand upon graduation." The OH 400 program is an avenue for coping with this demand.

Benefits of the Program

For the Ornamental Horticulture Department, OH 400 extends the scope of the teaching program into the practical realm to a degree unattainable with the present heavy load of students and limited laboratory facilities. In addition, a certain amount of cooperation, communication, and goodwill is fostered with both students and industry.

For the student, the advantages are obvious, they earn some money, get some practical experience, get a real-life first hand look at their field of study. The experience enhances their employability after graduation. They may be more likely to remember what is taught in the classroom following practical work experience. By the same token, some previous teaching may take on new life and meaning.

For the cooperating employers in industry, the program can be what they make it. It enables them to look at the quality of one or several OH students presently enrolled at the University of Florida, and the program could conceivably be used as a continuous screening device for selecting future permanent employees. Some find that working with students can be stimulating and that students may have something of value to contribute that pay off eventually, in dollars and cents. Naturally, the cooperator has a closer tie with the OH Department and may feel more free to call on the faculty if the need arises. Since not every firm in the state

can be a cooperator, there may be a source of pride involved, not to mention the satisfaction of helping guide an aspiring young person on a career that we ourselves have chosen.

So far the success rate of the OH 400 program is phenomenal and the OH Department is seeking cooperators to expand the program in every area of ornamental horticulture. If you are interested in giving one or more students an opportunity for full time practical work experience, please write or call the OH 400 advisor: Dr. Willard T. Witte, Ornamental Horticulture Department, University of Florida, Gainesville, FL 32611. (phone 904/392-1831) He is prepared to answer any questions a prospective cooperator may have.

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A PARTIAL TISSUE CULTURE METHOD FOR PATHOGEN-FREE PROPAGATION OF SELECTED FERNS FROM SPORES¹

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Abstract. Recently collected spores of several fern types were disinfested and successfully germinated on an agar-containing plant tissue culture (PTC) medium. Spores of maidenhair fern germinated within 5-7 days and prothallia were evident within 10-14 days. Approximately 3 weeks after initial culture of the spores, prothallia clumps were transferred intact to fresh PTC media. Clumps increased rapidly in size and required division and subsequent transfer to new media every 3-6 weeks. For several of the ferns tested, only the gametophytic stage was produced during culture *in vitro* on the agar-containing PTC medium. Gametophytic tissue comminuted for 5 sec in a blender containing 1/2 strength Murashige and Skoog (M&S) salts solution produced the sporophytic stage when transferred to soil. This method could be modified and developed for commercial production. It has the potential of reducing many of the manual transfers now required in current plant tissue culture propagation of ferns and appears to be effective in eliminating known-pathogens from propagative material.

Until recent years, ferns have been propagated by traditional methods (4) with new plants arising from spores, rhizome sections or crowns, divisions of mature plants, or from runners of mature plants that normally grow across the surface of commercial stock beds. However, the studies of Murashige (3) and his co-workers have contributed to the rapid multiplication *in vitro* of many ornamental plants by the method known as plant tissue culture (PTC).

The PTC method for the rapid propagation of ornamental plants (other than orchids) was initiated commercially in California with Boston-type ferns. Today many commercial PTC laboratories are producing Boston-type

ferns and others by the method developed (6). Ferns can be rapidly produced *in vitro* while eliminating the vast number of stock plants previously required in the production cycle. A disadvantage in this production method is the amount of manual labor required to make the transfers of sporophytic tissue in what are described by Murashige (3) as Stage II and Stage III. Included also is the labor and time involved in transplanting Stage III plants to soil.

The method to be described in this paper employs a partial PTC method that eliminates much of the manual labor required by the PTC method currently used by commercial operations.

Materials and Methods

All fern tissue cultures were started from spores collected from spore-producing stock plants growing at this research center or from plants growing in commercial nurseries. Whenever possible, recently matured spores were collected just prior to use. Prior to placement on the PTC medium, spores were disinfested employing a method similar to that described by Smith and Yee (5) for *Nephrolepis hirsutula* (Forst.) Presl. (hairy sword fern). The method employed here was as follows: Spores were placed in a previously autoclaved centrifuge tube which contained sterile deionized water (SDW) with Tween 20 (5000:1) added and the suspension was mixed on a Vortex (Scientific Products, McGaw Park, IL) test tube shaker. Tubes were centrifuged for 5 min and the supernatant discarded. A solution of 1 part commercial laundry bleach (sodium hypochlorite, 5.25% by wt) and 49 parts SDW with Tween 20 (5000:1) was then added to each tube, the fern spore pellet resuspended on the Vortex shaker, and the tubes centrifuged for an additional 5 min. The supernatant was discarded, the spore pellet resuspended in SDW and the tubes again centrifuged. The preceding resuspension-washing-centrifugation process was repeated 3 additional times. The resultant spore pellets were resuspended in 0.03 fl oz (1 ml) of SDW after the last centrifugation and the spore suspension streaked onto the PTC media surface.

The PTC medium employed for both spore germination and culture of the ferns tested consisted of: Packaged

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