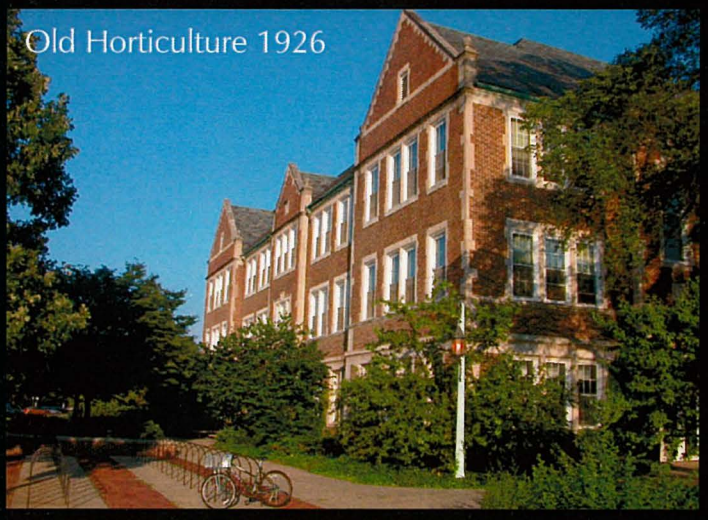
From Seed to Fruit:

150 Years of Horticulture at Michigan State 1855 - 2005


Eustace Hall 1888


Old Horticulture 1926


Plant and Soil Science 1986

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From Seed to Fruit:
150 Years of Horticulture at Michigan State
1855 - 2005

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Foreword

This history is the product of many contributors – and many hours sifting through accumulated publications, photographs and memoirs. **George Kessler** and **Frank Dennis** started thinking about writing a history of the Department in the early 1980s, and got as far as writing preliminary drafts of (a) teaching aspects and (b) research aspects in the latter part of the decade. The manuscripts remained largely untouched until **Dennis** retired in 1996 and began to revise and add information. Later **Harold Davidson** became interested in the project and contributed much information. As the sesquicentennial year approached, Dennis began interviewing current and former faculty members and some alumni on their experiences prior to and during their years at MSU. This book is the culmination of all these activities – not an end, as there can be no end to history, but a partial story of what the Department was and is.

Several books and manuscripts were especially useful sources of information, including: **W. J. Beal**'s *History of the Michigan Agricultural College and Biographical Sketches of Trustees and Professors* (1915); **Madison Kuhn**'s *Michigan State: The First Hundred Years* (1955); **Harold Lautner**'s manuscript, *From an Oak Opening* (1977) – a history of horticulture up to the division of Horticulture and Landscape Architecture in the mid-1920s; **Paul Dressell**'s *College to University: The Hannah Years at Michigan State, 1935-1969* (1987); **Bruce McCrystal**'s *The Spirit of Michigan State* (2004); **Keith Widder**'s *Michigan Agricultural College: The Evolution of a Land-Grant Philosophy, 1855-1925* (2005); and **Norris (Sandy) Bryson**'s Ph.D. Dissertation, *The Response of the Cooperative Exrtension Service to the Great Depression in Michigan, 1929-1938.* Literature references are excluded for the most part, as we believe that most readers will not be interested in such details. However, a bibliography of major sources is included. Other sources are available on request.

We are indebted to many who helped bring this project to fruition, including the more than 30 persons who spent their time answering our questions and recording their reminiscences, and the staff members who typed portions of the history. Special thanks are due to: **Fred Honhart**, MSU Archivist, for advice; **Val Berryman**, Curator of History, University Museum, for help with photographs; sources are given on p. 131. We thank **Jack Kelly, Lee and Jane Taylor, John Bukovac, Jerome Hull, David Dilley, Will Carlson** and **Sylvan Wittwer** for helpful suggestions and for reading various drafts of the manuscripts; **L. A. "Andy" Norman, Brenda Wolfgram Moore, Allen Monroe, Ruth Van Stee,** and **Christine Arvidson** for supplying information on "Halls of Fame" members; **Leigh Waltersdorf** for data on graduates; **Ron Perry** and **Will Carlson** for support in obtaining funds for publication; **Milton Baron** and **Nancy Smith** for information and assistance in writing sections of the chapter on gardens and the arboretum; **David Thomas** for leads to information on individual faculty; **Lorri Busick** for arranging for photographs of faculty, students, and staff and for help in preparing the manuscript; former undergraduates **Jane Cloutier, Becky Wing,** and **Alicia Wells** for their assistance in ferreting out information; current student **Erika Westfall** for assistance with fomatting; **Sandra Willis and Bill Davis** of the University Relations Printing Service for advice on preparation and printing of the chapters; and many other colleagues in the Horticulture Department, both past and present, who provided information, and/or took time from busy schedules to be interviewed. **Marlene Cameron** deserves special thanks for many hours spent putting the manuscript in nearly final form, as does **Katharine Dennis** for help with final editing and proofing.

We appreciate the support of those individuals and organizations who provided funds to support publication of this book; they are listed at the end.

In general, the story is told chronologically, but divided into sections. The first deals with the development of the Department – its evolution from one professor to part of a Department to one of the foremost Horticulture Departments in the nation. The teaching program is included in this part. We then review the evolution of the research programs, including breeding and selection, storage, growth regulation, rootstocks/training systems, soil and weed management, viticulture/enology, and mineral nutrition, in each commodity area – pomology, vegetable crops, floriculture, landscape horticulture. Sections follow on extension, student organizations, gardens, off-campus research stations, and, finally, a look at

current challenges. The book concludes with appendices providing information on faculty members and times of tenure, numbers of undergraduates, degrees earned by graduate students, cultivars released, major awards earned by faculty members, and names of District Horticultural Extension Agents, and of staff members who served 10 years or longer. A name index is included to assist in finding information on individuals.

The book contains relatively little information on the history of the horticulture industry in Michigan, as this would require one or more additional books. However, some sources of information on this subject are included in the bibliography.

We hope that this account will be of interest to all those with ties to the Department, whether as faculty, staff, students, or participants in extension or other programs. Given the volume of information available, we have only skimmed the surface, but we can't wait another 50 years, so please excuse our omissions!

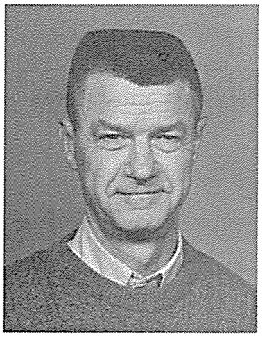
– The Authors

Additional Sources of Information

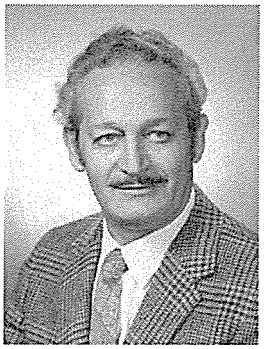
A bibliography is included listing references of interest to those who wish to learn more about the history of the Department. The following websites provide rapid access to the Department's current programs, including gardens and experiment stations.

MSU Horticulture Department
www.hrt.msu.edu
Horticulture Gardens
www.hrt.msu.edu/gardens/Index.htm
4-H Children's Garden
4hgarden.msu.edu/main.html
Clarence E. Lewis Landscape Arboretum
www.hrt.msu.edu/cella/
Horticulture Teaching and Research Center
www.hrt.msu.edu/htrc/index.html
Master Gardener Program
web1.msue.msu.edu/mastergardener/
Student Organic Farm
MSUorganicfarm.com/
Clarksville Horticultural Experiment Station
www.canr.msu.edu/wchrs/
North West Michigan Hort. Research Station
www.maes.msu.edu/nwmihort/
Southwest Michigan Research and Ext. Center
www.maes.msu.edu/swmrec/

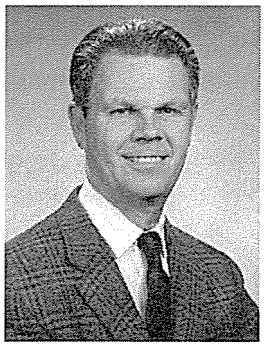
About the Authors



Frank G. Dennis, Jr. (1932-) was raised on a fruit farm in Upstate New York, and obtained B.S. (1955) and Ph.D. (1961) degrees in pomology at Cornell University. Following a post-doctoral fellowship in France and six years at the New York State Agricultural Experiment Station in Geneva, N.Y., he accepted a position as associate professor in Horticulture at MSU in 1968, and retired in 1996. His responsibilities were split between teaching both undergraduate and graduate courses and basic and applied research on the physiology of tree fruits, primarily apple and cherry, involving fruit set, fruit thinning, and dormancy/cold hardiness.



George M. Kessler (1917-), a native of Philadelphia, studied at the National Farm School (now the Delaware Valley College of Agriculture and Science) at Doylestown, Pa. He served as 1st Lieutenant with the 988th Signal Service Battalion in India, China, and Burma during World War II, and subsequently earned both bachelor's (1946) and master's (1947) degrees in horticulture at Pennsylvania State University. In 1947 he accepted a teaching and research position in the Horticulture Department at MSC, where he earned a Ph.D. in 1953. He retired in 1982 after 35 years as a faculty member. In addition to teaching introductory horticulture, pomology and woody ornamentals courses, he was responsible during many years for advising undergraduate students. Kessler served as Secretary-Treasurer (1957-63) and President of the American Pomological Society (1967-68), as well as editing (1953-71) the APS publication, *Fruit Varieties and Horticultural Digest.* In 1954 he published the book *Fruits, Vegetables and Flowers: Physiology and Structure in Relation to Economic Use and Market Quality.*



Harold Davidson (1919-2002), a native of Long Island, New York State, graduated from the 2-year associate degree program at the New York State School of Agriculture at Farmingdale, L.I., then enlisted as a private in the U.S. Army in 1940. He advanced to the rank of captain during service in the Signal Corps in Germany in World War II. He earned a bachelor's degree in Forestry at the University of California, Berkeley, in 1949. In 1950 he joined the faculty at MSC as an instructor and coordinator of the Agricultural Technology program in nursery and landscape management, and completed M.S. (1953) and Ph.D. (1957) degree programs while a faculty member. Harold taught courses in nursery management and propagation, served as extension specialist in nursery crops, and conducted research on control of weeds in nurseries and on propagation of tree species from cuttings. He co-authored, with colleague **Roy Mecklenburg**, four consecutive editons of the textbook *Nursery Management , Administration, and Culture.* After 34 years as a faculty member, Harold retired in 1984. He subsequently served as president of the MSU Retirees' Association, and was instrumental in obtaining pension adjustments for retirees enrolled on the "old plan," which was inadequate, given increases in the cost of living.

Synopsis

A Brief History of Horticulture at MAC/MSC/MSU

1855-1899

Horticulture was an important component of the teaching program from the start of the Michigan Agricultural College (MAC). **John Holmes**, who had been active in establishing the College in 1855, and who served as MAC's first secretary and treasurer, was appointed its first professor of horticulture in 1857. Under his direction, land was cleared, roads constructed, and new trees and shrubs planted by the students who attended formal classes in the morning, then worked on the campus for the remainder of the day.

A horticulture course was first offered by the Botany Department in 1858 – the second year of the College's operation. In 1872 the Botany Department became the Department of Botany and Horticulture, with **William J. Beal** as Professor and Superintendent of the Gardens. In 1883 Horticulture became an independent Department, **James Satterlee** ('69, M.S. '74) being named chairman. However, the domains of horticulture and botany overlapped in those early days. Some botany courses contained much of what today would be called horticulture, and Prof. Beal conducted experiments on seed viability, seed longevity, and plant breeding – subjects soon to become standard fare in horticulture.

In the early years, professors had major responsibilities for developing and maintaining campus grounds, including gardens and orchards. Research was voluntary, conducted according to the individual professor's interests and available time. **Liberty Hyde Bailey, Jr.** ('82), who became Department chairman in 1885, stressed the need for botanists and horticulturists to "climb the garden fence" and "bring science into the garden." He began a number of experiments in addition to his other duties, and by 1888, when he left MAC for Cornell, research had become an important part of the professor's activities. The importance of research was recognized nationally in 1886 with the passage of the Hatch Act , establishing the agricultural experiment station system; a year later, federal funds were made available for research.

The first branch experiment station for horticultural research in Michigan was established at South Haven. The farm owner, **T.T. Lyon**, had a large collection of fruit cultivars that he described and evaluated in annual reports to the Michigan State Horticultural Society. He became the Station's first director when the Board of Agriculture leased his property in 1889. The same year, a station was established at Chatham, in the Upper Peninsula. Some work was done there on vegetables and small fruits, but the climate was not suitable for fruit production.

The course offerings in Horticulture reflect the Department's growth during this early period. In 1899 three courses were required of all students – Vegetable Crops, Pomology, and Landscape Gardening; Floriculture was also required for women. (Ten women enrolled at MSC in 1870, but numbers were limited until a women's dormitory, Abbot Hall, became available in 1896.) Six horticulture electives were offered, including Experimental Horticulture. Clearly, the Department was not only growing, but branching out as well.

1900-1944

Given the interests of the students at the time, the Horticulture Club, organized in 1901, emphasized pomology, with speakers, orchard visits, and fruit displays. Beginning in 1908, the Club sponsored annual shows featuring extensive exhibits of apple cultivars. Floriculture and Landscape students later formed clubs; in 1928 floriculture students organized Delta Chapter of the national floriculture honorary Pi Alpha Xi.

The Federal extension service was initiated on passage of the Smith-Lever Act in 1914, but MAC professors had been presenting talks to farmers' organizations and at Farmers' Institutes (first offered in 1876) for 30 years. **Oliver White** ('07), first extension horticulturist, advised fruit growers on all aspects of production. Beginning in 1922, the service expanded to include radio programs. Advice on home gardening was especially appreciated during World Wars I and II.

The Department's emphasis was confined largely to fruits and vegetables, especially fruits, prior to the 1920s. Floriculture ("gardening") was considered to be more of a hobby than a profession, and was taught primarily for women. The advent of commercial greenhouses in the early part of the 1900s provided the impetus for adding floriculture to the curriculum. Two courses in floriculture were available in 1920, a short

course was added in 1926, and by 1928, eight courses were being offered. In 1924 floriculture was added to the list of concentrations, viz., vegetable gardening and floriculture, pomology, and general horticulture. At the beginning of the 1930s, floriculture was second only to pomology in number of majors, and became a major industry in Michigan over the next 75 years.

From the mid-1800s to the early 1900s, much effort was devoted to description and evaluation of cultivars, which were in most cases chance seedlings; few controlled crosses were made. The 1920s witnessed the first serious attention to plant breeding. At the South Haven Experiment Station **Stanley Johnston** ('20, M.S. '30) made a thorough study of the peach industry, then developed the cultivars that would lead the way for the next 40 years. In addition, based primarily on Johnston's research, the highbush blueberry became one of Michigan's major horticultural crops.

World War I reduced student numbers, but young soldiers who came to the campus for military training were exposed to college and the opportunities it offered. This, no doubt, contributed to the increased enrollment and crowded classes after the war ended.

During this period, two additional research stations were established. In 1917 **Robert Graham** of Grand Rapids donated his farm to the College; this became the Graham Station, where research was conducted on tree fruits and woody ornamentals until its closure in 1987. In 1941, 80 acres of muckland north of Lansing were developed as a research farm, primarily for vegetable crops. This farm continues to be used by faculty in Horticulture and other departments. **David Friday**, who served briefly (1922-1923) as president, persuaded **V.R.Gardner** ('05) to return to his alma mater in 1922 to oversee construction of a new Horticulture Building, completed in 1928. President Friday also saw the need for an enlarged graduate program. As of 1919, the Department had awarded only 12 master's degrees. By 1927, the faculty had doubled from 5 to 10 professors and the first Ph.D in Horticulture was awarded to **Howard Dexter Perkins**. A total of 94 graduate students earned M.S. and /or Ph.D. degrees between 1920 and 1945.

In the 1920s, as canneries were being established in Michigan, food science became an important aspect of horticultural research. The numbers of faculty working in this area continued to grow until the section was "spun off" in the 1960s to form a separate Department of Food Science, housed at first in the Horticulture building, later in the old Dairy Building.

The effects of the Great Depression of the 1930s were felt in Michigan and the entire world. In response, programs such as 4-H and extension were expanded. People were eager to learn how to do more with less, be it farming or producing food for home use. The Depression also stimulated the growth of organizations such as the Farm Bureau and the Grange.

World War II began as the nation was emerging from the Depression, and men and women again left the campus to serve in the military. Concerns about food supplies gave rise to the Victory Garden program, directed by **Paul Krone**. On campus a cannery was built, funded by **Henry Ford** and operated by the Horticulture Department. In 1944, 75,000 gallons of vegetables from College fields were processed to supply dormitory kitchens.

1945-1969

Following the war the G.I. Bill furnished a college education to many veterans who otherwise might never have attended college, creating a major expansion in college enrollment. **President Hannah** led the efforts to construct new buildings and hire new faculty as College enrollment ballooned from 6,776 prior to the War to more than 13,000 in 1946. By 1970 approximately 180 students were enrolled in Horticulture, half of whom were graduate students; 450 graduate degrees were awarded between 1945 and 1970, and about the same number of B.S. degrees.

In 1945 President Hannah recruited **Harold Tukey**, then working at the Geneva Experiment Station in New York State, to be the new chair of the Horticulture Department. Tukey developed many important contacts with growers and grower organizations, and with scientists in the United States and abroad. Under his leadership, the faculty grew from 16 professors in 1945 to 36 in 1951. Additional faculty continued to be added in the 1950s. These recruits proved to be excellent choices, and greatly enhanced the Department's reputation,. Their students became leaders in both industry and academe.

The new faculty included **Robert Carlson** (M.S.'49, Ph.D,'52), a colleague of Tukey's at the Geneva Station, who followed him to MSC and continued the work that they had begun at Geneva on rootstocks for fruit trees. **Robert Carolus** came from Virginia; his work on nutrition and water relations greatly benefited Michigan vegetable growers. **Clinton Petersen** and **Shigemi Honma** introduced new cultivars of vegetables, including pickles, cucumbers, cauliflower, lettuce and broc-

coli. **Petersen's** work on cucumbers resulted in a new method of hybrid seed production, and made possible mechanical once-over harvest of pickling cucumbers. When Petersen moved to Wisconsin, **Larry Baker** succeeded him and continued breeding cucumbers, as well as developing a number of carrot cultivars. Beginning in the 1950s and extending to the end of the century, breeders of florist crops, including **Judd Haney, Kenneth Sink,** and **Lowell Ewart**, introduced many useful cultivars of commercially important species.

The Extension Service introduced the district agent system in Michigan in 1946. This supplemented services rendered by county agents by providing specialists responsible for specific commodities (e.g., fruit, vegetables) across several counties where such crops were especially important. Over the next several years, district horticultural agents were assigned to southwest, northwest, west-central and eastern Michigan.

Part of the Horticulture Building was renovated in 1947, after the Department of Landscape and Urban Planning moved to new quarters. In 1949 new greenhouses were constructed on Farm Lane, increasing the space available for research in the plant sciences. Because of the projected construction of the Natural Sciences Building to the southeast in 1949, the gardens next to the Horticulture Building were completely redesigned in the late 1940s. Additional changes were made when the Student Services Building was constructed on the east in 1958.

In 1954 **Alvin Kenworthy** introduced a service using leaf analysis to determine the need for fertilization of fruit trees. In 1959 he oversaw the purchase, installation, and use of a $ 40,000 direct-reading spectrograph that could analyze a series of elements in one sample.

The uses of growth regulators and radioisotopes became important during Dr. **Tukey's** tenure, and he maintained a strong interest in both areas. With his encouragement, **Sylvan Wittwer** and **John Bukovac** ('51, M.S. '54, Ph.D.'57) became leaders in both areas in their work with the growth-controlling effects of gibberellins and related compounds, as well as the use of radioisotopes to track the penetration of nutrients and growth regulators into plant tissues. Bukovac later used gibberellin to limit flowering in virus-infected sour cherry trees, thereby increasing vegetative growth and yield. In addition he was a pioneer in investigating spray application technology and how growth regulators penetrate the cuticle.

Controlled atmosphere (CA) storage of apples was introduced in Michigan by **Donald Dewey** soon after he joined the Department in 1951.The procedures he developed allowed storage of fruit until the following spring, thus lengthening the marketing season and increasing the quality of fruits available to consumers in late winter and early spring. **David Dilley** ('55, M.S. '57) joined him in this research on becoming a faculty member in 1960. Dilley made a number of contributions, including improvements in storage practices and a better understanding of the physiology of ripening, especially the role of ethylene.

John Carew, who became Department chair on Harold Tukey's retirement in 1962, had been very effective in extension, and continued the tradition of maintaining strong ties with the horticultural industry. He also wrote columns for trade journals on a regular basis. During his tenure an electron microprobe X-ray analyzer was installed in the Horticulture Building for use by all University scientists. This instrument permitted the measurement of elements in small segments of biological and mineral samples.

In 1955 the Southwestern Michigan Growers Association leased a 60-acre farm near Sodus, and established a research station in cooperation with the College, with emphasis on vegetables and small fruits. Costs for maintenance and operation were shared by the growers and the Agriculutral Experiment Station.

Plans for establishing a medical school on what was the Horticulture Farm just south of the Grand Trunk rail line required the purchase of additional property south of campus in 1963. The new Horticultural Teaching and Research Center, including pole barns and storage facilities, was completed in 1967, and new plantings of tree and small fruits were made for use in teaching and research.

In the mid-sixties, **Sylvan Wittwer, Augustus ("Gus") De Hertogh,** and **Richard Stinson** began a program on forcing flower bulbs, funded by the Dutch Flower Exporters Association. Many cultivars of tulips, daffodils, and hyacinths were exposed to chilling temperatures for varying periods of time to determine the optimum conditons for forcing. The data obtained were published in book form for growers' use.

The herbicide 2,4-D was introduced in the 1940s, and many experiments were conducted by **Robert Carlson, Charles Hamner,** and others on its use in horticultural crops. Additional compounds became available in the 1950s and '60s, and **Stanley Ries** ('50) was among the first to evaluate them. One of these, simazine, proved to not only kill weeds, but to increase nitrogen and protein content of the crops on which it was used.

1970-1989

Ecology became a major concern in the 1970s, as students flocked to Horticulture and other agricultural fields in response to a national interest in the preservation of natural resources. Undergraduate enrollment in Horticulture increased from approximately 75 in 1970 to over 500 in 1990, and courses with large numbers of non-majors required special attention to meet the demand. Major adjustments in scheduling and student advising were akso nececessarty, and **Patricia Erwin** ('73) joined the Department in 1974 with responsibilities in these areas. This increase in student number provided an impetus for later construction of a new building to house both Horticulture and Crop and Soil Sciences, completed in 1986. Undergraduate enrollment had dropped to 200 by 1990, while the number of graduate students remained constant. A total of 1310 B.S. and 383 M.S. and PhD. degrees were awarded during the two decades.

Alan Putnam (M.S. '63, Ph.D. '66) obtained his Ph.D. with **Ries**, and continued working with synthetic herbicides as a faculty member. Together with organic chemist **Muraleedharan Nair**, who joined the Department in 1987, Putnam searched for naturally-occurring compounds that could be used to control weeds. Some of these were too toxic for such use, but application of sorghum residues proved effective in control of some weed species.

In the mid-1970s Ries and co-workers noted the effects of alfalfa meal in stimulating plant growth. Subsequent work led to the identification of a naturally-occurring long-chain alcohol – triacontanol – that promoted plant growth at very low concentrations.

To reduce water use, Israeli researchers introduced the concept of trickle or drip irrigation. In the mid-1970s and 1980s **Kenworthy** was instrumental, along with **Charles Kesner** ('61, M.S. '62, Ph.D. '66), in establishing trickle irrigation systems in commercial orchards. They developed protocols for use of this method by Michigan growers, including pump capacity, size of tubing, and maintenance.

Following **Stanley Johnston**'s death in 1969, **Robert Andersen** (M.S. '64), continued Johnston's peach breeding program and began breeding sour cherries. His replacement in 1982 was Amy **Iezzoni**, who focused her research on breeding sour cherries. She collected sour cherry germplasm from Eastern Europe to broaden the base of her program, and introduced a Hungarian cultivar -- renamed Balaton -- with the red flesh and juice needed by processors. Following completion of a Ph.D. at the University of Minnesota in 1992, **William Shane** first cooperated with Iezzoni in the peach breeding program, then assumed responsibility for it at the Southwestern Michigan Research and Extension Center (SWMREC) near Benton Harbor.

To consolidate off-campus research facilities, land adjacent to Interstate 96 near Clarksville was purchased in 1974. Activities at three research stations (the Graham Station, by then surrounded by the city of Grand Rapids; South Haven, enclosed by that city; and Sodus) were discontinued as the Clarksville station was developed. However, local pressure for branch stations led to the creation of new facilities in both the northwestern and southwestern parts of the State.

In the mid-1970s fruit growers in the Traverse City area saw the need for a research farm. They organized the Fruit Growers Council, and raised funds to purchase an 80-acre farm on the Leelanau Peninsula in 1978. The Station was opened in 1979, with emphasis on cherries.

The heavy soil at the Clarksville Station was not well suited to research with vegetable crops. Therefore growers in Southwest Michigan, backed by State Senator **Harry Gast**, obtained funding for a research station near Benton Harbor. The Southwest Michigan Research and Extension Center was opened in 1987, and specializes in research with vegetables, grapes, and stone fruit breeding.

Following **John Carew's death** in 1977, a search was conducted for a new chairperson, and **John F. (Jack) Kelly** ('53, M.S. '57), then Chair of the Vegetable Crops Department at the University of Florida at Gainesville, became chair in 1978. Kelly was soon involved in a number of projects, including completion of the Clarksville Station, planning for construction of the new Plant and Soil Science Building, completed in 1986, and hosting the joint meeting of the American Society for Horticultural Science and the Canadian Society for Horticultural Science in the summer of 1988.

Kelly also oversaw the "computer revolution" as the desktop computer replaced the mainframe for most users. One of the projects involving computers was the creation of the Spartan Ornamental Network (SON) by **Will Carlson**, assisted by **Sandy Allen**. This provided greenhouse growers with up-to-the-minute information and advice on all aspects of greenhouse operation and marketing of plants. This service has steadily grown in popularity as computers and internet use have bccome more widespread.

Ronald Perry succeeded **Robert Carlson** in rootstock research following Carlson's retirement in 1979. His subsequent interests included comparisons of rootstocks for both apple and cherry, as well as training systems for apple trees on size-controlling rootstocks. Carlson continued for several years as secretary of the International Dwarf Fruit Tree Association, an organization that he had served since the mid-1950s, then turned the reins over to Perry.

In 1981 the Department, along with Botany/Plant Pathology, Crop and Soil Sciences, and Forestry, initiated a Plant Breeding and Genetics Graduate program, which provided a new series of graduate courses, as well as greater coordination among departments.

In 1983 the **Clarence E. Lewis** Arboretum, named in honor of the Department's outstanding teacher of woody plant materials, began taking shape under **Robert Schutzki's** leadership.

1990-2005

In 1993 the dreams of **Will Carlson** for a new Horticulture Garden and **Jane Taylor** for a 4-H Children's Garden materialized. Both gardens were dedicated in August. The gardens, adjacent to the new Plant and Soil Sciences Building, encompassed 18,000 ft.^{2} – more than 10 times the area of the old gardens on north campus.

Early in the 1990s the floriculture section instituted a program to generate money for research with greenhouse crops. Cooperating growers agreed to donate 2 cents per square foot of greenhouse space to a special fund. This provided a major boost to the research of **Royal Heins** and others, leading to temperature programming to control the growth of pot plants, and "graphical tracking" to monitor the growth of Easter lilies and other species, permitting growers to bring the plants into flower at the optimum time. In addition, **John Biernbaum** and his graduate students introduced methods to limit use of fertilizer in greenhouses, thus reducing both costs of production and environmental pollution.

Jack Kelly stepped down in 1990 to return to teaching and research, and **Wayne Loescher**, professor at Washington State University, was named chair. Loescher had a strong interest in carbohydrate metabolism in both vegetables and fruits, and was able to continue his research program, despite administrative duties, by obtaining research grants for post-doctoral fellowships. During Loescher's tenure internships for undergraduates became a requirement for graduation. In 1992 the University began the shift from quarters to semesters, requiring major changes in curriculum, including a 1/3 reduction in numbers of courses. This created many problems during the 4-year changeover, especially for professors conducting field research.

Use of computers in teaching, research and extension accelerated in the '90s, as new programs were developed and better computers became available. A computer laboratory for students was included in the new building, and slides and other programs were made available. Computers allowed researchers to obtain climatic and other information from data loggers in remote areas, and determine exact locations by geopositioning. Access to the internet allowed researchers to exchange information and to access databases for identification of compounds and, especially, DNA sequences. As growers acquired computers, extension personnel could provide current information and even diagnose problems from their offices.

University and Agricultural Experiment Station funding of research continued to decline on a constant dollar basis in the 1990s, but Loescher encouraged faculty members to apply for additional external funding. As a result, the base budget increased from $3 million to $9 million during his tenure.

Project GREEEN (Generating Research and Extension to Meet Economic and Environmental Needs) was introduced by the College in 1996 with a budget of $500,000, increasing to $6.5 million within a few years. This program provided legislative appropriations for operating funds and support personnel for applied plant research. These funds allowed researchers to develop data bases to be used in applying for support from granting agencies.

Interdepartmental and inter-institutional research has increased steadily in a number of areas, encouraged by both common interests and limited funding. For example, researchers representing many institutions in the United States and Canada have cooperated on USDA project NC-140, a stone and pome fruit rootstock testing program. This has allowed a long-term evaluation of the effects of rootstocks on yield and efficiency of production of several cultivars.

Biotechnology began to be used in research in the 1980s and its use accelerated thereafter. **Rebecca Grumet** (M.S. '80, Ph.D. '85), the first faculty member in Horticulture with a strong background in the field, returned to MSU in 1987, and has worked on virus resistance in cucumber. **Steven van Nocker**, arriving in 1998, has conducted research with both Arabidopsis and tree fruits. In 2002, the Plant Transformation Center, directed by **Kenneth Sink**, began operation. The

Center coordinates and funds research on genetic transformation and regeneration in a selected number of species, including sour cherry, blueberry and celery.

Wayne Loescher resigned as chairman in 2000, but continued his research program. **Ronald Perry** was named acting chair, becoming chair in 2002. Following the pattern set by **Jack Kelly,** he has created an industry advisory committee, consisting of representatives of all areas of horticulture, to provide advice and feedback.

Public concern about pesticides in foods has stimulated research in developing systems to reduce or avoid the use of synthetic chemicals for such purposes. Integrated pest management (IPM) systems were investigated in the 1970s, mainly by entomologists and plant pathologists, with the cooperation of horticulturists. At that time emphasis was on more efficient use of chemicals by providing data on insect life cycles for timing sprays, and the encouragement of natural predators. Emphasis has now shifted to integrated crop management (ICM), involving research, not only on insects and diseases, but on nutrition and water use as well. A long-term project, begun by Horticulture, Crop and Soil Sciences, Botany/ Plant Pathology, and Entomology, together with several producers of organic fruit, is comparing methods of pest control, from completely organic to the methods currently in use by commercial growers.

With financial support from funding agencies, **John Biernbaum** changed emphasis in research from floriculture to organic production of vegetables and fruits, and organized a cooperative organic farm at the Horticulture Teaching and Research Center. **Mathieu Ngouajio** and **Sieglinde Snapp** are investigating the use of cover crops, plasticulture, farm manure (as a replacement for inorganic fertilizer) and other methods to reduce weed competition and maintain soil structure. **Tom Fernandez** is exploring the use of semi-aquatic plants to absorb fertilizers and pesticides in runoff water from nurseries, and **Brad Rowe** is investigating the effects of "green roofs" – establishing plants such as sedum on roofs – in cooling buildings while reducing run-off and prolonging the life of roofing materials.

Emphasis in the Department has been on production, rather than human health or marketing, but **Muralee Nair** is evaluating various horticultual sources of antioxidants that can reduce the incidence of cancer and other disorders. **Bridget Behe** and her students have made several studies of marketing of horticultural products, including carrots. Most of Michigan's cherries are processed, but **Greg Lang** is evaluating cultivars and cultural methods for growing and marketing sweet cherries as fresh fruit.

By 2005 the number of undergraduates in Horticulture was about 280, while graduate enrollment had fallen from 80 to 70. Degrees were awarded to 719 undergraduates and 215 graduate students between 1990 and 2005.

Changes in curriculum are on-going. A recent change in course offerings is the inclusion of 1-credit sections of courses as a means of satisfying the needs of students who wish to learn about specific aspects of a subject, such as pruning or composting, without having to take a 3-credit, full semester, course.

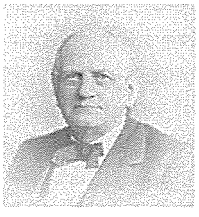
SUMMARY

The Horticulture Department has been transformed since 1855. Course content has expanded greatly as new information has become available about cultivars, pest control, nutrition, and many other aspects of producing and marketing crops. The Department's focus changed as new departments, such as Landscape Architecture and Food Science, were formed, and new areas of horticulture developed. The Department will continue to change as problems arise and new fields open, whether in crop production or genetic engineering. We are fortunate in having had leaders with insight and initiative who were able to anticipate future needs and to find the researchers and teachers who could help solve the problems faced by growers and students. In 1855 **John Holmes** had as his goal for the new college to improve and teach the science and practice of agriculture. We hope that the Horticulture Department continues to meet this goal, through the combined efforts of all those directly involved professionally in some aspect of horticulture, as well as those who take pleasure in watching seeds germinate, and plants grow, flower and produce fruit.

Chapter 1.1

People and Programs. Part 1.1
In the Beginning (1855-1907)

The Department of Horticulture has played an important role in the development of Michigan Agricultural College (MAC) from an "oak opening" at the time of the enactment by the State legislature in 1855 of the law which gave it life, to its present position as one of the members of the "Big Ten" and the American Association of Universities. MAC's first secretary and treasurer, **John** C. Holmes, was named its first professor of horticulture in 1857.


John C. Holmes

Holmes was one of the founders of the Michigan State Agricultural Society, organized in 1849 with the primary purpose of founding an agricultural college. He had lobbied for the law's passage and was instrumental in finding the site and developing it, as well as establishing the College's organization and recruiting the faculty.

On September 3, 1856, the Board adopted the following action:

> J. C. Holmes, Esq., of Detroit, Secretary of the Michigan State Agricultural Society is appointed to the Department of Horticulture, comprising growing of ornamental trees, fruit trees, shrubbery, and vegetables. Experiments with the seeds of trees and vegetables, orcharding, vegetable gardening, and landscape gardening. (sic)

MAC was dedicated on May 13, 1857; on the following day 63 male students began their studies, tuition-free, with **Joseph R. Williams** as President. The four-year program included mathematics, agriculture or chemistry, English and natural science. The students attended classes in the mornings and worked in the afternoons to clear trees, plant fields and gardens, and convert a forest into a campus

Holmes taught no formal courses, but he did supervise students in fruit and vegetable production and in developing the campus, then a 677-acre area of forest, charred stumps, and swamps. In 1858 he set out the first evergreens, including Norway spruce, white pine, Austrian and Scots pine, and red cedar. In addition to these duties, Holmes designed the first buildings, developed the first program of study, and established the College's library with 200 volumes donated by the Agricultural Society.

Some confusion exists as to when horticulture officially became a separate department. The "Department of Horticulture" is often mentioned in early reports and catalogues, yet Botany and Horticulture formed one department under **William J. Beal** from 1872 to 1883, when the two were separated. The first horticulture course, a one-term offering for sophomores, was taught in 1858. In November of 1859, the Board of Education, which became the Board of Agriculture in 1861, approved a system of study that included one year of preparatory study and two of professional study in theory and practice of agriculture, agricultural chemistry, civil and rural engineering, botany and vegetable physiology, zoology and animal physiology, horticulture, and practical farming.

George Thurber was appointed Professor of Botany and Vegetable Physiology in 1858, and taught botany, vegetable physiology, and horticulture. He assumed the title of Superintendent of Gardens, Orchards, and Grounds on Holmes's retirement in 1861.


George Thurber

Thurber had earned an M.D. at the University Medical College of New York, but was a student of medicinal plants, and at the time of his appointment was Professor of Materia Medica and Botany at the New York College of Pharmacy. He led his classes on plant collecting expeditions through the surrounding forests and swamps, and took them camping on the shores of Pine Lake (now Lake Lansing). On one such expedition in 1860, he and Holmes brought back several hundred pine and spruce seedlings to soften the lines of the newly cleared campus.

The gingko tree near Beaumont Tower was planted by students under Thurber's direction. He fired the imaginations of his rural charges with his campfire tales of his experiences in New York City and his plant exploring on the U.S.-Mexican border. Although a great botanist, he had little use for the struggling student. Furthermore, he smoked and drank, which was not in keeping with the mores of the time. On leaving MAC, he became editor of the *American Agriculturist* and was considered to be the most accomplished horticultural writer of the period.

When **Thurber** resigned in 1863, **Albert N. Prentiss** ('62), who had assisted him as student foreman of the gardens, replaced him, with the title of Professor of Botany and Horticulture and Superintendent of the Gardens.

Although Prentiss was the only instructor of Botany and Horticulture in 1863, the College catalogue lists Horticulture as a separate department, responsible for grounds maintenance, but not instruction. Prentiss taught courses in horticulture, offering landscape gardening for the first time, in 1864, and supervised the care of the orchards and gardens, but his strong suit was plant identification and analysis. He spent much of his time developing in his students a love for flowers, trees and shrubs. To many people he seemed "reserved and formal." "Only after friendship and confidence had conquered his reserve, did the warm-hearted man... appear" (**Oscar Clute**, quoted by **Beal**, p. 409).


Albert N. Prentiss

Among Prentiss's students were **W. W. Tracy** ('67) (see below), **Charles E. Bessey** ('69), later Professor of Botany and Dean of Agriculture at the University of Nebraska, and **Charles W. Garfield** ('70, M.S. '73). Garfield briefly held the post of foreman of the grounds shortly after graduation. He served as secretary of the Michigan State Horticultural Society from the late seventies until 1885, and was a member of the Governing Board of MAC for 12 years. He was instrumental in establishing a forestry curriculum at MAC, and became known as the "father of Michigan forestry" for his efforts in encouraging research in this field. He was named Director of the State Forestry Commission in 1888 and was awarded an honorary Doctor of Laws by MAC in 1907.


Charles Garfield

By 1863, the College had a planting of small fruits, a vegetable garden and a small orchard (started in 1858) – all providing food for the Boarding Hall, as well as experience for the students. Arrangements were made in 1864 to construct a conservatory and a propagation house at the College, and 200 pear trees were added to the orchard. In 1865, apples fruited for the first time in the orchard, vegetable cultivar trials were conducted, and Prentiss introduced a new tomato cultivar ('College Seedling').

A new 'Peach-Blow" potato was highly acclaimed in the 1866 report, and Prentiss exhibited both vegetables and flowers at the Michigan Central Agricultural Society Meeting in Lansing in September. Vegetables from the College garden, sold or stored, were valued at $494.21. In the same year the Department planted 350 Norway spruce and 150 arbor vitae trees on campus, mainly as windbreaks, built a new bridge, and improved walks and drives. Prentiss complained that the campus development and maintenance responsibilities were very costly and labor-consuming for the Department – a complaint often repeated in later years.

In 1867 the Department started a nursery in which trees were grown for the campus, the orchard was finally freed of stumps, and a much-needed greenhouse had finally been completed at a cost of $1000 and was partially filled with plants. **Prof. Robert Kedzie** (Chemistry) had reported the results of fertilizer trials with field crops as early as 1864, and Prentiss compared the performance of corn and beans grown on either "barren" soil or topsoil in 1867. No data were obtained, however, as the trial was "defeated by an inroad from swine..." Horses were used for the first time to replace much of the student manual labor in the vegetable garden. The following year the tool room was enlarged, an office, seed room, and fruit storage were added in College Hall, and Prentiss ran tests on 36 tomato and 58 potato cultivars.

A brief account of the first orchard, from planting by President **Williams** in 1858 until removal of most of the trees in 1906, is given in Beal's history (p. 73). The planting of 121 fruit trees in 1865 brought the total to 381. Although the apples were "thrifty," they grew "too fast" to bear much fruit; this despite a note in the report for 1866 that the soil was poor and that the Department hoped to move the trees. The report for 1868 contains a prophetic note to the effect that dwarf trees fruited more in proportion to their size than did the standard trees; this was confirmed in replicated trials by **H. B. Tukey** and others some 75 years later.

In a small college, professors' interests ranged widely. Thus chemistry Prof. Kedzie commented in 1865 on the disappearance of the peach from many parts of the state within the previous 30 years. He prophesied "... the peach seems destined to take up its final abode in a narrow strip skirting the Eastern shore of Lake Michigan. Has the destruction of forests opened fields and orchards to the sweep of that terrible scourge, the southwest wind... ?" Kedzie began collecting meteorological data, and was later joined in this by Professor Beal.

Although 21 acres were planted in vegetables in 1866, these appear to have been devoted to class projects and/or production of food for student meals. "Many" tomato cultivars were compared in 1867, although no data were published as to yields. In 1868, 206 cultivars of 23 species were compared in the garden and yields for potato (58 cultivars) and tomato (36 cul-

tivars) were published. Student labor used in the garden was valued at 7 cents per hour in 1869. Produce not used for student meals was sold; sales receipts in 1872 for apples totaled $6.83, for vegetables $303.26. The plants maintained in the greenhouse were valued at $2,127.75.

Botany and horticulture courses were closely linked in the early years. The relationship between the two programs was pointed out, and ornamental plants were grouped together in Botany, fruits and vegetables in Horticulture. Students continued to be the primary source of labor for the Department. In 1869, Horticulture used 2,088 hours of student labor in the vegetable garden, 910 hours in the greenhouse and hot bed, and 787 hours in the apple orchard. Landscape Gardening was first listed under the Department in the 1869 catalog, although it was taught by the Horticulture instructor. Students at the College numbered 132 by 1870, when ten women were admitted. They took the regular courses, but their afternoon assignments were confined to florist crops. Special living arrangements were made for these students in Williams Hall; they were allowed to occupy rooms on the floor where the steward and his family lived. In his annual report for 1870, **President Abbot** commented that "The experiment of having women as students has worked out so successfully that there would be no hesitation in admitting them if there were a hall for them." Only in 1888, when Abbot Hall was made available, did a dormitory for women materialize.

Prentiss moved to Cornell in 1869 and **W. W. Tracy** ('67, M.S. '70, D.Sc. '07) was appointed in his place. Tracy had served as foreman of the conservatory (1868) and then instructor in horticulture and superintendent of the grounds (1869-70). On completing his M.S. in 1870 he was appointed Professor of Botany and Horticulture and Superintendent of the Gardens. The faculty in Horticulture increased from one to four in 1870 with the addition of **Thomas, Fuller** and **Henderson**, as the the State Board of Agriculture recognized the Department's growing needs.

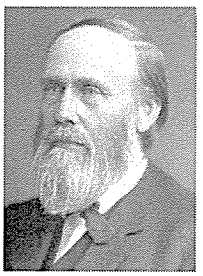

W. W. Tracy

Little attention was paid to research during this period; teaching, with emphasis on memoriziation, was the main concern, and the facilities were meager. In recalling his days as a student, **C. E. Bessey** ('69) commented, "We memorized so many pages and repeated them as nearly as possible verbatim" (Semi-Centennial Celebration, p. 85).

Scions of fruit cultivars were often given to the Department by citizens of the State. In 1871 scions of 109 apple cultivars were donated by **T. T. Lyon** (see fruit breeding and selection section below), then of Plymouth, who served as President of the Michigan State Horticultural Society from 1876 to 1893.

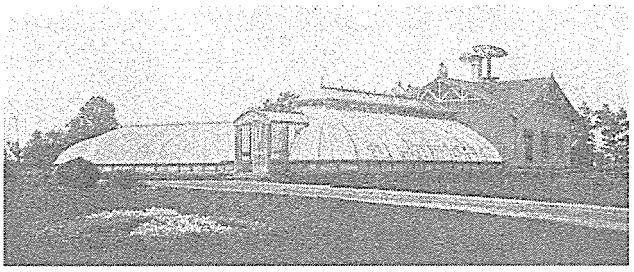
The Impact of W. J. Beal (1872-1882)

In 1871 Prof. Tracy resigned as Head to devote himself to seed production, becoming superintendent of seed growing for D. M. Ferry and Co. Research began to play a greater role in horticulture when **W. J. Beal** was named Professor of Botany and Horticulture and Superintendent of the Gardens (subsequently Professor of Botany and Horticulture and Curator of the Botanical Museum). Beal held an A.B. from the University of Michigan and an S.B. from Harvard, where his instructors had included the renowned botanist **Asa Gray** and the zoologist **Louis Agassiz.** He lectured in Botany at MAC in the summer of 1870, prior to his full-time appointment, and continued to teach and conduct research in East Lansing for 40 years.

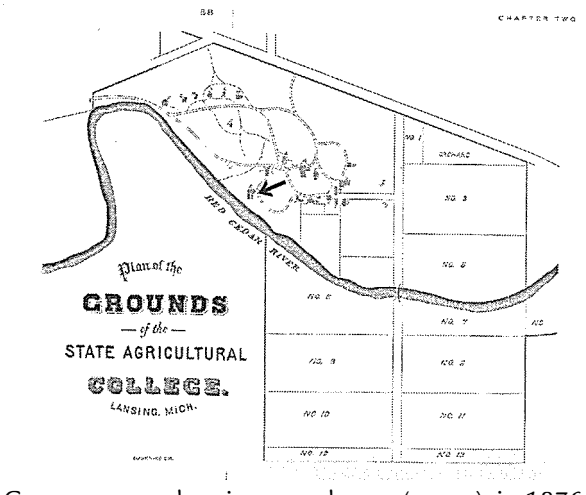

W. J. Beal

Beal's interests ranged far and wide, and he made numerous contributions to Michigan and U.S. botany and agriculture. Plant breeding was just becoming of scientific interest in 1872, although **Gregor Mendel's** work on genetics had yet to be rediscovered. **Charles Darwin's** observations on natural selection led Beal to initiate experiments that were the forerunners of modern techniques of hybridization. Although a botanist by training, he worked primarily with agricultural crops, including corn and other grains, forage grasses, apples, cherries, gooseberries, raspberries, grapes, and tomatoes. Research in the Department under Beal expanded greatly. In 1873, 140 species of grasses were planted in 3 x 10 ft. plots for evaluation, experiments in orchard cultivation were undertaken, apples were crossbred, and numerous cultivars of grape, currant, raspberry, blackberry and strawberry were tested.

During Beal's tenure, a new greenhouse/conservatory and wing were completed (1874) at a cost of $8000. It consisted of a conservatory (50 x 25 x 10.5 feet), and a wing (62.75 x 25 x 10 feet) containing a storehouse, rose house and grapery, and **C. W. Garfield** was named foreman of the gardens, becoming Department Manager in 1877. A florist, a vegetable gardener, a research assistant and a teamster were added to the staff, and students' wages were raised to 10 cents per hour. (This reportedly increased their productivity.)



Greenhouse, built in 1874, in 1884



Campus map, showing greenhouse (arrow), in 1876

Garfield reported that a market existed for all the produce that could be raised "at living prices." By 1878 the daily trip to Lansing allowed for transport of plants, flowers, vegetables and fruits to the city market and return of the mail.

However, the news was not all good. A spring hail storm in 1875 broke 800 panes of glass in the greenhouse!

Beal encouraged farmers and others to be on the watch for improved "sports" (mutations) and to save the seeds of the highest yielding grains. In 1877 he performed an experiment with corn that was a forerunner of the concept of hybridization to improve vigor and yield (see Research section). The results also suggested that the pollen cultivar affected the color and flavor of the fruit (a phenomenon known as "xenia"); **L. H. Bailey** and others subsequently showed that this was not true. Beal later commented on one of the problems he faced in making crosses. Seeds from cross-fertilized apple fruits were carefully planted in the greenhouse, and "the mice ate every seed. Away went twenty-five dollars worth of labor – some two years of time – and all my prospects of new apples from that lot of seeds." Every researcher can empathize with Beal's feeling of frustration in this loss.

Farmers' Institutes. A major innovation in 1876 was the beginning of Farmers' Institutes – lectures given by professors in various cities across the State to provide information directly to farmers. Beal later cited the inauguration of these institutes as "one of the milestones of progress for the Michigan Agricultural College." The institutes soon became very popular among Michigan farmers – and their wives; the six held in 1876 had increased to 70 by 1895-96, when **Kenyon L. Butterfield** was appointed full-time Director, and to 292 in 1904, after **L. R. Taft** had resigned as chairman of the Horticulture Department to become Butterfield's successor.

At the first of the institutes, held at Traverse City January 17, 1876, Beal described numerous horticultural experiments performed by himself and others. Of particular interest were the following comments: "Some of [the many questions raised by farmers] can and probably will some time be solved, but most of them, in my opinion, never will be solved ... Nothing that will ever be done can relieve the farmer from thinking and experimenting for himself. ... Some chemist has said that no experiments compare in difficulty with those the farmer may be required to make." He proceeded to discuss the influences of scion on stock and vice-versa, cultivar testing, exchange of seeds to avoid "the error and evil consequences of raising plants for a long succession of generations under the same conditions..." and the crossing and hybridizing of plants.

Seed Testing and Viability Experiments. Beal conducted numerous experiments to test seed viability, and delivered lectures on the results at Farmers' Institutes. He commented that "a great deal of money has been paid for worthless seeds left at groceries all over the country." In testing vegetable seeds purchased from several seed companies, he reported germination rates that ranged from a high of 84% to a low of 4%. In addition, the seeds that did germinate in samples with poor germination produced weak seedlings. Similar data were presented for various species of grass and clover. Once Beal's reports became public, at least four companies stopped selling seeds or went out of business. This paved the way for current laws that require that seeds sold commercially be tested for both viability and purity.

In other Institutes, Beal referred to seed longevity on burial in moist soil, including a (presumably apocryphal) case in which raspberry seeds had remained viable for 1700 years! His interest in this subject led to his now famous experiment, begun in 1879, in which he buried seeds of 21 different species, mainly herbaceous weeds, in sandy soil contained in pint bottles. These were dug up and tested for germination at intervals of 5 years (changed to 10 years in 1920 to prolong the experiment). Seeds of only 3 species ger-

minated in 1980, the 101st anniversary of the initial planting. Germination of mullein (*Verbascum blattaria*) seeds was still good (42%), whereas only one seed of each of the other species germinated. In 2000 half of the mullein seeds germinated following chilling.


Bottle for seeds

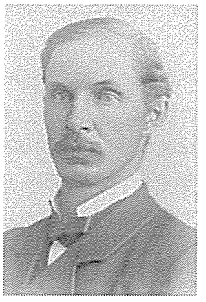
Beal took on additional duties in 1875 when he was made Curator of the Botanical Garden, marking the beginning of what is now the oldest continuous botanical garden in the United States. In his 1877 report to the Board of Agriculture, he lamented the fact that the duties of overseeing the students' labor in the "Horticultural Department" had left him little time to plan and carry out "valuable experiments." In the fall term he was required to teach world history, leaving even less time for experimentation. Beal was not the last Department Head to vent his frustrations on the subject. Some of his difficulties undoubtedly arose from his wide-ranging interests and his inability to say "no" to the many requests to serve as a society officer or as a speaker.

Instruction in Horticulture Expanded. In 1875, juniors spent 13 rather than 8 weeks on horticulture courses, covering all phases of fruit and vegetable culture, plant breeding and propagation. On April 15, 1875, "a gang of five juniors, with a foreman, were pruning apple trees; six were raking leaves on the lawn and trimming borders of drives; three hoed the ridges away from small trees in the nursery; three worked in the greenhouse; two ground tools; one ran the lawn mower; two put in a brick partition in the seed loft; four helped get up hay on the lawn; one showed visitors about; the rest worked on the drives." In 1876, seniors with a special interest in horticulture were put in charge (for 6 months) of student labor working in a specific area such as the grape vineyard, orchard or nursery. Juniors were shifted among areas every few weeks to give them a variety of experiences, and a permanent hot bed was built. Supervision of all Departmental work outdoors was assigned to **Louis Knapper** in 1881.

Horticulture and Botany Become Separate Departments. In January 1883 Horticulture and Botany were made independent departments. Included in **President Abbot's** annual report to the Board for 1881-82 are the following statements:

> Botanical – This department from the first of January, 1883, will be as distinct from that of horticulture as two departments so closely related, and mutually independent of each other, can well be; but its final limits have not been as yet well defined...
>
> Horticultural Department – ...The Department will have charge of the College Park [campus], the vegetable garden, the greenhouse, and adjacent beds and borders, and the drives and walks.

Prof. Beal was named Professor of Botany and Forestry in 1882, and **James Satterlee** ('69, M.S. '74) became Professor of Horticulture and Landscape Gardening and Superintendent of the Horticulture Department (meaning care of the grounds). He was assisted by **James Cassidy**, florist, and a foreman. Satterlee, a native of Greenville, Mich., had operated a farm there following graduation. He was a good farmer and horticulturist, but not trained in research methods. He taught landscape gardening to the sophomore class during the summer term of 1884, but most of his duties dealt with supervising the care of the campus – graveling the drives and walks, repairing the greenhouse, and caring for the lawns, gardens, nurseries, orchards and vineyards. (Unfortunately, in his last report, he noted that "The growth of many of the [apple] trees has almost entirely ceased.") He resigned on October 9, 1884 to take a position with the Michigan Board of Health, and later (1910) served as treasurer of the State Horticultural Society.


James Satterlee

Bailey Arrives and Horticulture Climbs the Garden Fence

Liberty Hyde Bailey, Jr. ('82), who took over the reins of the Department from Satterlee, had established his reputation at his alma mater well in advance of graduation. **Eugene Davenport** ('78), later Dean of the College of Agriculture and Director of Agricultural Experiment Station at the University of Illinois, was a senior when **Bailey** entered MAC, and was assigned to correct freshman themes. He later wrote, "One day I stumbled upon a freshman essay beautifully written, a rarity indeed." He considered it out of his class, so gave it to Professor **George T. Fairchild**, his supervisor. After

reading the paper himself, **Fairchild** predicted "that boy will either make a great man or he won't amount to shucks." The first prediction proved correct, for the writer was **L. H. Bailey** (Rogers, p. 72). In Bailey's senior year, **Beal** reportedly introduced him to a visitor as "a young genius" (Rogers, p. 50). Bailey served as first editor-in-chief of the student journal, *The College Speculum* – one of many "firsts" to be associated with his name; he published in the *Botanical Gazette* and other scientific journals while still an undergraduate.


Liberty Hyde Bailey, Jr.

Bailey's years as a student, and later as Chairman, at MAC served as the "seed-time" for his later contributions to the extension function of the agricultural college, including 4-H. His first and last editorials for the *Speculum* and his first book, *Talks Afield: About Plants and the Science of Plants*, were pleas for greater emphasis on practical training in agricultural education. Much of this interest can be traced to first-hand experience as a teacher in a rural school.

Agriculture students at MAC traditionally were excused from classes during the 3-month winter term. In 1879-80 this term was unusually long, lasting 5 months, and Bailey was hired to teach in a one-room school house, the Carl School on the outskirts of East Lansing. Here he made a lasting impact on his students. He used unusual teaching methods for the time, teaching "nature-study," including grafting, during recess and on Saturday. He taught by direct observation and by developing skills, rather than "by the book." One former student, **William Donley**, remembered how "he showed us things we'd never thought to look at before."


"Speculum" Board. *Seated:* Beal, Bailey, Prof. Samuel Johnson, L.W. Hoyt ('82); *Standing:* H.W. Collingwood ('83), O.C. Howe(?) ('85), and J. W. Beaumont ('89)

Following graduation, Bailey worked briefly as a reporter for the Springfield, Ill., *Monitor*, then accepted a position as Assistant Curator at the Harvard Herbarium under **Asa Gray**. In Cambridge he met other famous botanists, including Professor **Charles Sprague Sargent**, and made the most of opportunities to attend lectures and study the many plants available at the Herbarium, the Arnold Arboretum, and the gardens in and around Cambridge. In December of 1884, Bailey was offered the position at MAC vacated by **Satterlee**. Despite the admonition of one Harvard associate that he would never be heard from again, he accepted the position.

Bailey was to spend only 3½ years as a professor at MAC; the remaining 69 years of his life were devoted to teaching, administration, plant exploration, and writing at Cornell University. Nevertheless, this was a productive period. Bailey transformed a department that was largely oriented toward teaching and gardening into one that emphasized research as well. He stressed the need for horticulture to "climb the garden fence." "To get our science from the field and the laboratory into the garden, is the problem of the age."

The scope of the experiments he began ranged widely – varietal testing, stock/scion interaction, influence of latitude on flowering time of fruit trees, and hybridization. He was particularly interested in improving wild species of fruit plants, including nuts, plums, currants, and gooseberries. At the same time he began to publish the books for which he became famous, including *The Garden Fence, Talks Afield* (see above), and *Field Notes on Apple Culture*; all were easy to read, and contained practical information for the farmer, the gardener, and the public at large. The popularity of the books reflected Bailey's ability to charm an audience. His courses were filled, not only with agriculture students, but with would-be doctors and engineers, as well. He was much in demand as a lecturer, and was chosen president of the Ingham County Horticultural Society in 1886.

Bailey brought a new and refreshing approach to the teaching of landscape gardening and the care of the grounds. Some perceived a lack of attention to the grounds under Bailey's supervision, but **President Willits's** response was "That's true, but Bailey is a genius, and you mustn't hitch a race horse to a plow." Bailey's report of 1885 provides both a description of the "Park" and information on his views of teaching landscape gardening:

> "The college is fortunate in the possession of an unusually fine park which embraces one hundred acres of undulating and broken surface. Ten professors' residences are arranged along one side of the park, while the central and rear portions are occupied by college buildings, some twenty in number. Opposite the residences, the park is skirt-

ed by [the] Red Cedar river, a part of whose banks are high and precipitous, its whole length skirted with native trees and bushes. The grounds are laid out under the dominant features of the picturesque, and in the main the individual objects are arranged with excellent taste. The preservation of natural undulations of surface and of wooded banks and forest trees, with the entirely natural growth of spruces, is especially fortunate. The grounds illustrate all of the important principles of picturesque gardening. The selection of ornamental plants is large and instructive. During the lectures on landscape gardening, I take the students out-of doors and point out to them the salient features of gardening."

Agricultural Experiment Station Established. In 1885 the Michigan Legislature provided funds for annual publication of two agricultural bulletins by each of the six MAC departments. This was followed in 1887 by passage of the Federal Hatch Act, which called for the establishment of agricultural experiment stations, and, beginning in 1888, provided $15,000 annually to each state for the support of both pure and applied research. At MAC, **President Willits** became director, and Professors R. C. **Kedzie** in Chemistry, **A. J. Cook** in Entomology, **Beal** in Botany, **S. Johnson** in Practical Agriculture, E. A. **A. Grange** in Veterinary Science, and **Bailey** in Horticulture each devoted one-third of his work to the Station's research program. In 1895 the staff included three assistants in horticulture. The Adams Act of 1906 increased federal funding by another $15,000 annually.

Horticulture Laboratory. The Department was badly in need of better facilities than the basement of College Hall. In 1880 the Botany Department had acquired a building of its own; now it was Horticulture's turn. In 1886, President Willits informed the State Board of Agriculture that Michigan growers were asking that more attention be given to the needs of the Horticulture Department. A separate building with new teaching facilities was especially needed, given the ever increasing number of students in horticulture classes, which now stood at 150. Bailey not only pressed for a new building but urged that students be exposed to horticulture before their junior year.

Thus Willits, with the support of Michigan horticulturists, asked the Legislature to appropriate funds for the first building to be constructed in the United States solely for the teaching and study of horticulture. The Legislature responded with an appropriation of $ 5000 in 1887, and the building, designed by Bailey, was completed in November 1888 at a total cost of $ 7000. (First

Horticulture Lab, 1889. Note greenhouse on far right.

known as "Horticulture Laboratory," the name was changed to Eustace Hall in 1961 in honor of Prof. **Harry J. Eustace**, the much beloved professor and chairman of the Department from 1908 to 1919.) The building consisted of three floors. The basement contained storage rooms for fruits and vegetables, a general marketing room with cement floor, an "operating room" for grafting and other activities, and a "heeling-in" cellar for nursery stock. The ground floor contained a tool room, a photographic dark room, an office and a carpenter shop; a small greenhouse was attached on the east end. A classroom occupied about half of the third floor; in addition there were a hall containing museum cases, a seed room, a laboratory, and a storage/museum room.

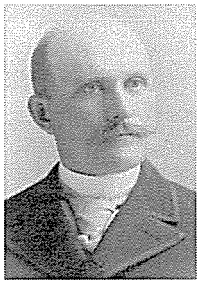
The new building was considered a major achievement, but Bailey's final report (1888) included some complaints that would be heard again. "...despite the fact that much of the pioneer work of the department has been done, there yet remain many annoyances and burdensome features which could easily be remedied. By far the greater part of the work of the professor of horticulture is concerned with matters which are not strictly horticultural." He then provided a list: too much "scavenger and errand work" and lack of a greenhouse, teamsters [drivers], an irrigation system for experimental gardens, paved walks between buildings, a field mower, and sufficient supervision for student labor.

In June 1888 both **Beal** and Bailey made a trek across the pine barrens of the northern lower peninsula of Michigan to determine what grasses might be grown in the sandy soils. Together with **Charles F. Wheeler**, a druggist who was recognized as an authority on plants, two of Bailey's students, a deputy sheriff and two reporters from Detroit, they traveled from Harrisville on the east to Frankfort on the west, collecting samples en route, to determine the potential of cutover forest land for agriculture. They concluded that exotic species would be needed to do the job. Subsequent experiments by Beal and Robert Kedzie suggested that forest species might be the best choice.

A few weeks after completing this trip, **Bailey** departed MAC. He had received an offer from Cornell that was too good to be refused – not merely a better salary, but funds to allow him to visit the gardens and horticultural institutes of Europe. He left behind a strong foundation for what was to follow, including establishment of the federally-supported Agricultural Experiment Station organized at MAC in February 1888. In 1958 a U.S. postage stamp was issued honoring Bailey on the 100th anniversary of his birth.

Taft Succeeds Bailey

In 1888 the College chose **L. R. Taft** to replace Bailey as Department chair. As professor of Horticulture at Missouri Agricultural College, Taft had begun work on orchard spraying, a practice which was still in its infancy, and he continued this work at MAC until 1892 (see research section).


Levi Rawson Taft

In 1892 the College property included a 100-acre campus, a 10-acre vegetable garden, 5 acres of small fruits, a 35-acre orchard, and 160 acres of woodland. Two new forcing houses costing $1500 were completed. The old greenhouse had been replaced with a new one, 25 x 38 ft., costing $4500, and constructed with an iron framework. New hot beds and cold frames and a florist's residence were also added next to the greenhouse.

Teaching Program. The Horticulture teaching program was significantly revised in 1895-96. Sophomores now took the Vegetable Gardening lecture course for a half term in the spring and a half term of Landscape Gardening in the summer, each course accompanied by practical experience on each subject in the afternoon. Juniors could take Pomology for a full term starting in 1896, and work with horticulture crops in the fall, or they could elect to take floriculture-spraying and greenhouse production in the winter, and a horticulture elective in the spring. Seniors could elect advanced horticulture, covering commercial production methods for fruits, vegetables and flowers, in winter term.

From the College's beginning, students had been required by law to work 12 to 15 hours per week on the campus. Freshmen did the "back work" while upper classmen supervised. Before leaving MAC, Bailey, citing a student workbook, noted the following activities, among others, in June-July 1888: pruning apple trees; weeding onions; mowing with a lawn mower; potting strawberries; shoveling earth; cleaning apple trees; pruning young wood from vineyard; picking peas; cleaning drive, killing currant worms; planting apricots; poisoning potato bugs. As a student, Bailey himself had profited from such work, and had told **Beal** that the experience of pruning grapes was "worth more than all of your lectures" on the subject. Beal agreed.

Assigning work was no problem when the student body was small and there were trees to be felled, stumps to be pulled, and ditches to be dug, but became more and more difficult as student numbers increased and the campus became more "civilized." Professor Taft and his staff of 3 or 4 men, for example, were responsible for keeping 125 students busy for 3 hours every afternoon. In 1892 students were required to spend 2.5 hours per day working on the campus. Finally, in 1897, the system was abandoned in favor of laboratory instruction, and Horticulture had to hire full-time employees to care for the campus.

Short Courses Introduced. The first short course at MAC was Farm Dairying, taught to 23 students in 1894. Short courses in horticulture were listed for the first time in the 1895 catalogue as.a 6-week winter program, including one in Fruit Culture and another in Floriculture and Vegetable Gardening. The students met each day for lectures on horticulture, and also took courses in chemistry, botany and meteorology each day for 3 weeks. Later it became an 8-week course, and with the exception of 9 years (1927-38), when it was offered for 2- and 4-week periods, continued for 30 years. The name was subsequently changed to Commercial Fruit Course and was available as a specialized interest course within the Young Farmer General Agriculture program.

An article in the MAC *Record* for December 7, 1909, entitled "Short Course Reopens Jan. 4," provides some details about the courses offered at that time. Board and room was approximately $4 per week, and the total cost of the 8-week course "not far from $45." (Six and four-week courses cost $35 and $25, respectively.) The day began at 8 a.m. at the judging pavilion with animal husbandry, proceeded to the Farm Mechanics building at 9:30, and then to the Horticulture Building, followed by sessions in (1) animal feeding, business, arithmetic, beekeeping, and correspondence, or (2) agricultural chemistry, or (3) physics. Instruction in Horticulture included "methods of spraying, cultivating and pruning apple orchards. Methods of vegetable gardening are presented and methods of improving and beautifying the home surroundings are discussed." Fruit growing was taught as a special 4-week course.

The list of Horticulture courses being offered continued to expand. By 1899 three courses – Vegetable Crops, Pomology, and Landscape Gardening – were re-

quired for all students, and Floriculture was required for women. In addition, elective courses were available in Flower and Vegetable Forcing, Spraying and Pests, Evolution of Orchard and Garden Plants, and Commercial Horticulture (advanced studies of the most important horticultural crops). Two more elective courses were added for seniors – one dealing with the harvest, marketing and transport of fruit, and a second called Experimental Horticulture.

In the spring of 1897, the Department distributed seeds to a number of rural schools in Michigan to encourage the use of flowers for beautification. The long vacation was changed from winter to summer, because, as noted by **President Snyder**, (1) rural schools in Michigan no longer had a short winter term, which in the past had enabled MAC students to support themselves by teaching, and (2) the work of land clearing, drainage, and fence removal, which provided work for students in summer, was no longer available.

Taft's aides included a foreman of gardens, a florist, and one or more hired men. **Charles S. Crandall** ('73, M.S. '89), **A. G. Gulley** (M.S. '73), **and Thomas Gunson** served successively as foremen.

Thomas Gunson (1858-1940). Horticulture's Tommy Gunson became an institution during his 40-year tenure. Born in Scotland, he completed an apprenticeship as a gardener on an English estate, worked for a time in English nurseries, and came to Michigan via Quebec in 1882. He worked on farms at Vassar and Saginaw, then married **Annie Rose**, a friend of MAC President **T. C.** Abbot. On his first visit to campus, he met **Mrs. Wm. J.** Beal, who arranged an interview with then **President Oscar Clute** and **Professor** Taft. This led to his employment as foreman of the grounds, beginning in April 1891. For the next 40 years he lived in the campus greenhouse residence and taught horticulture classes. He planted or helped plant more trees and shrubs on campus than any other person. One of his students wrote, "We were in the greenhouse. Crowded about the Gardener were my classmates… Witticisms were exchanged back and forth, and the Gardener usually enjoyed the final laugh." He became a storehouse of campus lore and the most popular speaker at alumni gatherings.


Thomas Gunson

Gunson planted the pines which now keep the blow sand in place behind Demonstration Hall. **Russell Kelty** ('19), who often walked with Gunson, considered him to be a "most remarkable man." He was "very independent" and didn't like autos or traveling by auto; he felt that they interfered with his Anglo-Saxon heritage of walking.

In addition to his campus duties, Gunson was a member of many local organizations, including the Rotary Club. Although he was not an East Lansing taxpayer, given his residence on campus, he became mayor of East Lansing in 1909. During his tenure the City completed the water system, the Fern Street area was drained, a sewer system was installed in Collegeville, and a house numbering system was inaugurated. One of East Lansing's streets bears his name. In 1921, he represented the local Rotary Club at the international convention in Edinburgh, Scotland.

Taft Takes New Position as Director of Farmers' Institutes. In 1902 Taft became Director of the Farmers' Institutes. He held this position until 1917, when the Institutes were consolidated into one week-long "institute" – Farmers' Week. Thereafter, farmers, high-school students and the public at large came to the campus to learn about the latest techniques in all areas of agriculture and home economics. (In 1985, the name was changed to Agriculture and Natural Resources Week to better reflect the subjects covered.) In addition to his position as Institute Director, Taft also served as State Inspector of Nurseries and Orchards until 1921, then as Chief Horticulturist for Michigan until 1924. However, his "pride and joy" was Evaline Orchards, a cooperatively-owned, 400-acre farm with 150 acres of apples and cherries near E. Jordan on Lake Odessa, of which he was president beginning in 1910.

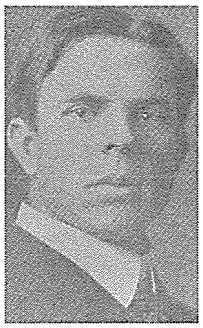
Hedrick Becomes Chair

In 1902 Ulysses **P.** Hedrick ('93, M.S. '95), who had accepted a position as assistant professor under Taft in 1899, became Professor and Department chair. He was a native of Iowa, but had spent his boyhood on a farm at Little Traverse, near the tip of Michigan's lower peninsula. A prolific writer, he later recorded some of the scenes of his youth as the son of a pioneer in *Land of the Crooked Tree*. While completing his M.S., he served as assistant to Taft, then held consecutive positions as Professor of Horticulture and Botany at Oregon Agricultural College, State Inspector of Orchards and Nurseries in Michigan and Professor of Horticulture at Utah Agricultural College.

By 1903 the student population at MAC had reached 854, and much needed renovation had begun. **Charles A. McCue** ('01) was appointed Instructor of Horticulture, increasing the faculty in the Department to three, and 15 different courses were offered. The 700-book horticultural library

was finally catalogued, and the campus greenhouses were used almost entirely for teaching.

Courses offered by the Department in 1902-03 were as follows, with numbers of students in parentheses: Plant Propagation (72) in spring of sophomore year; Pomology (45) in fall of junior year; Floriculture (45) in the winter of junior year; Landscape Gardening in the Junior year (14), Spraying of Plants (12) in spring of junior year; Harvesting and Marketing (12) in fall of Senior year; Evolution of Horticultural Plants (14) in the winter of senior year; Experimental Horticulture (12) in the spring of the senior year. In addition, a 6-week short course was offered in the winter. The annual report included the statement, "Short courses do not commend themselves to fruit growers [because] it is absolutely impossible to teach horticulture in six weeks, and especially at a time of the year when work out of doors cannot be done." Three courses -- Pomology, Floriculture, and Vegetable Gardening – were suggested in the place of one in which only a "smattering" of these subjects was covered. The first service course for another department, Forest Tree Propagation, was offered in 1904 for Forestry juniors.


Ulysses P. Hedrick

Hedrick summed up the chief aim of the Department in 1903 as "to instruct students in Horticulture by teaching; instruction by experimentation belongs to the Experiment Station; and the dissemination of horticultural information ...belongs to the Experiment Station and Farmers' Institutes." He echoed his predecessors in bemoaning the Department's responsibility for tasks other than teaching. "The most burdensome and annoying work... is that which has nothing to do with teaching horticulture. I refer to the errand, the ice, the vegetables, the fuel, the scavenger, and the general utility work now imposed upon the department." An additional problem in 1904 was the extra work created by the digging of tunnels on campus to supply heat from the central heating system. The "beauty of the grounds was marred," and the Horticulture Department was responsible for healing the wounds.

In his final report (1905) Hedrick summarized the accomplishments of the Department during his tenure. He noted the better facilities for teaching, a better grade of work from the students, and the change from the "wholly unsatisfactory system of student labor to a system of laboratory courses," as well as additional courses to total 15. The Horticultural Laboratory had been remodeled to include four laboratory rooms, an herbarium, a stock room, and a club room for the student Horticulture Club, plus a "small, but perfectly equipped greenhouse." Also, the main range of greenhouses had been adapted for laboratory purposes. The Department now consisted of the Chairman plus five assistants -- four full-time, and one student. Hedrick took advantage of his departure to express his "very great dissatisfaction" with the non-professional work cited above, and "the custom of furnishing the Legislature, State, and college officials with flowers and plants." He suggested that the latter practice either be discontinued or that the College pay the Department for "such donations." This practice continued, but to a lesser extent, until the mid-1960s.

In 1905 Hedrick followed **Bailey** to New York, where he was to become Director of the Geneva Agricultural Experiment Station and author/editor of the famous illustrated series on the fruits of New York, containing descriptions of most of the available cultivars of peach, plum, pear, cherry, grape, and small fruits.

Fletcher Becomes Head, But Sheds the Job of Campus Grounds

Stevenson W. Fletcher became Department Head on Hedrick's resignation, with the title of Professor of Horticulture, and Landscape Gardening and Superintendent of the Horticulture Department. However, in October 1905 the Board named **Gunson** as Superintendent of Grounds, taking the burden of their maintenance from Fletcher's shoulders. A native of Massachusetts, Fletcher had earned a B.S. from Massachusetts Agricultural College ('96) and a Ph.D. from Cornell ('00), and had held positions as professor at Washington State College, W. Virginia University, and Cornell. During his tenure as Head, a cold storage room was added to the basement of the Horticulture Laboratory, and the University celebrated its 50th year of existence with a jubilee on Commencement Day (May 29, 1907), with **President Theodore Roosevelt** as honored guest.


S. W. Fletcher

Fletcher and Gunson were involved in plans for surveying the campus, and for recommending placement of buildings and "other improvements." This required some tact, as there were disagreements between the Board and **Adam Oliver**, the architect who did the survey.

Fletcher's views on the teaching of horticultural subjects were expressed in 1907; similar views were to lead to the formation of the Department of Landscape Architecture in the 1920s.

> We must recognize that what is commonly called horticulture includes several very distinct kinds of work. There is not more relation, for example, between the two horticultural subjects, greenhouse industry and pomology, than between vegetable gardening and agronomy. Moreover this department teaches landscape gardening, which as a profession, is not horticulture at all but an art, based partly on horticulture, partly on engineering, and partly on architecture So the demand has arisen for special training in each one of the several distinct branches of this department.

Fletcher also authored a book on horticulture -- "How to Make a Fruit Garden: A Practical and Suggestive Manual for the Home Garden" -- one of the few texts available to students. **Floyd Barden**, '08, later observed that to find additional resource material, students borrowed the reports of the Michigan Pomological Society from the office of the Secretary of State in Lansing.

CHAPTER 1.2

PEOPLE AND PROGRAMS. PART 2 FROM MAC TO MSU (1908-1955)

Harry J. Eustace

Fletcher resigned in 1908 to become Director of the Virginia Agricultural Experiment Station, and **Charles P. Halligan** was appointed Acting Head. In August of 1908 **Harry J. Eustace** ('01) returned to his alma mater as Head, and remained in that post for 12 years, aside from leaves of absence in 1915 and 1917. He was awarded a Master's of Horticulture by MAC in 1911, and in 1914 assumed the duties of Vice Director of the Experiment Station, in addition to those of Department Head. **Russell Kelty** (Entomology '19) remembered him as "very punctual; you could set your watch by the time he arrived at work."

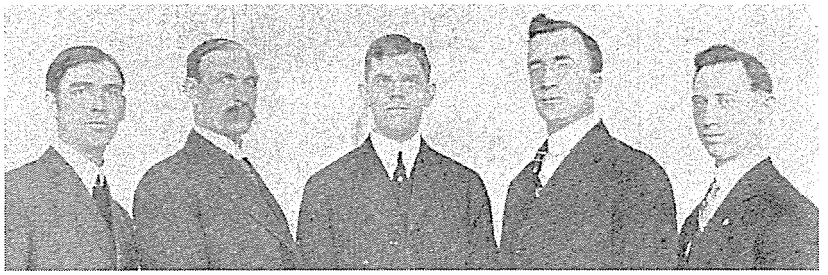
In his 1909 report, Eustace was critical of the tendency to "popularize" (water down?) course content, and stated his intention of making students appreciative of the "science of the work." He also regretted "that after 20 years of the [experiment] station's existence there was no horticultural work under way, that all the experiments had to be started recently, and that the past publications are... of very little value..." This seems a rather harsh indictment of his predecessors as Department Heads. Experiments were subsequently initiated and numerous bulletins were published, many authored or co-authored by Eustace, dealing with renovation and top-working of orchards, cover crops, control of insects and diseases, thinning apples to increase size, fertilization of vegetables, and breeding of apple, cherry, plum, lettuce, and tomato.

The Horticulture teaching faculty consisted of Eustace, Halligan, **Gunson and Hood.** In 1912, 18 courses were offered in Horticulture. All agriculture students were required to take Vegetable Gardening. Pomology and Plant Propagation had to be taken by all Agriculture sophomores, while Greenhouse Industry, Landscape Gardening, Plant Breeding, Evolution of Cultivated Plants, Experimental Horticulture, and Seminar were required of all Horticulture students, who also had to take either a series of three courses in Advanced Pomology or Advanced Landscape Gardening. Two service courses – Plant Propagation-Vegetable Gardening, and Landscape Gardening-Floriculture – were offered as electives to Home Economics juniors. In 1914, Horticulture classes were over-enrolled, with 161 students in the sophomore Fruit Growing course.

Smith-Lever Act Creates Cooperative Extension Service. Farmers' Institutes provided information for farmers, but did so in a formal setting, emphasizing lectures, rather than on-farm demonstrations and one-on-one contact. In 1909 the Michigan State Legislature provided funds to support what was to become the extension service, and the Department hired its first extension agent, **Oliver K. White** '07. In 1914 the U.S. Congress passed the Smith-Lever Act, providing federal funds for extension. This permitted the hiring of additional agents to work with vegetable growers and to conduct Farmers' Institutes (see Extension section).

Recognizing that Horticulture had now outgrown its building, in 1914 **President Snyder** recommended to the State Board of Agriculture that a new Horticulture building and greenhouses be built as soon as possible. Another 10 years were to pass before ground was broken for these buildings.

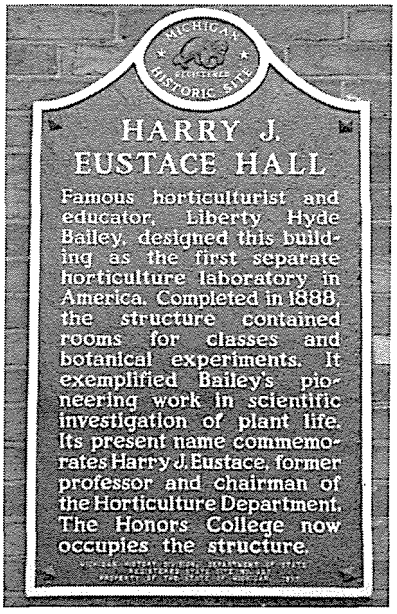
During Eustace's leave in 1915, **George T. Hayes** was appointed Acting Head and was later hired for one year to help with teaching duties. By this time, College enrollment had risen to 2000 – nearly twice the population of East Lansing. Thirty-five members of the 1915 graduating class – and one M.S. candidate – were Horticulture majors.



Left to right: O.K. White, T. Gunson, H.J. Eustace, C.P. Halligan, G.W. Hood.

Military Activities on Campus in World War I. When the United States entered the "war to end all wars" in 1917-18, 42 MAC faculty members, including four from Horticulture (**H. C. Moore, John H. Carmody** ('12), **R. W. Peterson** ('16), and **H. D. Hootman**), entered the service. In 1917

Eustace was called to Washington to serve as Associate in Charge of the Perishable Foods Division under Food Administrator **Herbert Hoover**, not returning until October 1918. This left **Halligan**, who served as Acting Head, and **Robert Loree,** who joined the faculty in 1913, to teach all Horticulture courses.



During the war, members of the Student Army Training Corps were stationed on campus. Two mess halls and eight temporary barracks housing 1400 men were constructed east of the Horticulture Laboratory. A world-wide influenza pandemic broke out in 1918, and Michigan was not spared. A kitchen was installed in the basement of the Horticulture Building to feed some of those afflicted.

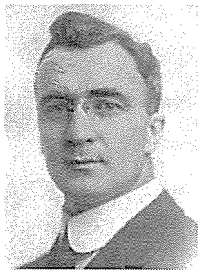
Post-war Readjustment. In 1918 Army training programs at the College were terminated. Readjustment was not easy, and classes were crowded with many returning servicemen, some badly injured, shell-shocked, and/or poorly educated. A "three-cornered" program was established by the Federal Government for over 100 former servicemen from Wisconsin, Ohio, Indiana, and Michigan. The three corners were small fruits, taught by Loree, poultry, taught by **Carl Card**, and beekeeping, taught by **Russell Kelty**. According to Kelty, many of the veterans ("Federal Aid" students) were poorly motivated, gambled with the money they received as pay, and sold some of the equipment furnished them, such as the bee veils, to obtain cash.

Hoping to encourage a more positive attitude, Kelty decided to try giving the students some bees if they would buy three hives with their own money. This turned out to be a very successful program, for it helped the men to earn money. (For some reason, Kelty and the apiculture program were transferred from Entomology to Horticulture in 1927.)

In 1919 Eustace resigned to become Pacific Coast Manager in the Advertising Department of the Curtis Publishing Co., but maintained contact with the campus and often presented lectures. He had established close ties with USDA researchers and with California businesses, and placed Department graduates with them. He was named an honorary Doctor of Agriculture by the College in 1942, and in 1956 the Harry Eustace Memorial Scholarship Fund was established by his friends and admirers to provide a small annual cash award for a worthy Horticulture undergraduate in the area of horticultural marketing.

The old Horticulture Laboratory, no longer needed by the Department, was remodeled in 1952 to house the Honors College. It was named Eustace Hall in 1961, and was entered on the Michigan Register of Historic Places. A State historical marker was placed at the entrance in 1976. In 1998, the building was renamed Eustace-Cole Hall, honoring **Jeffery** (BA '70) and **Kathryn** (MBA '90) **Cole,** who provided the funds for the restoration of the building. Eustace-Cole is now the second oldest building on campus, the oldest being the old library, renamed Linton Hall.

Halligan Succeeds Eustace. Charles P. Halligan, who replaced Eustace as Head in 1919, was a native of Boston, graduated from Massachusetts Agricultural College in 1903, and had taught horticulture and landscape gardening at both the National Farm School (name later changed to Deleware Valley College) at Doylestown, Pa., and at his alma mater prior to being appointed an instructor at MAC in 1906. Given his interest in ornamentals, he later became the head of the Landscape Architecture Department – a one-man department until additional staff were added.


Charles P. Halligan

Organization of Michigan State Farm Bureau. Horticulture had a small role to play in the establishment of the Michigan State Farm Bureau. Many county farm bureaus had been formed in the 1900s and held joint annual meetings. However, in 1919 a state farm bureau was organized at a meeting held on the MAC campus. **Clark Brody**, the executive secretary of the Bureau for many years, described the meeting in his book *In the Service of the Farmer* (Michigan State University Press, 1959). County agents and farmers from 57 county farm bureaus met in the lecture room of the Horticulture Building on February 4 and 5, 1919. Brody noted that "there was a lengthy, bitter discussion on the ways and the extent to which the Michigan farmer was being exploited..." Dr. **Eben Mumford,** encouraged by MAC President **Frank Kedzie** and Dean **Robert S. Shaw**, suggested that county bureaus be united under a state-wide bureau. Over two days, the representatives drafted a constitution and by-laws for the Michigan State Farm Bureau, and Mumford was appointed State leader.

New Faculty Following WWI. In 1917 **H. Donald Hootman** was named Foreman of the Orchards and Gardens, replacing **Gunson**. After serving in the U.S. Army in World War I, he was appointed Superintendent of the Graham Experiment Station in 1921, then Extension Specialist for Tree Fruits in 1924. He served in both this position and as secretary of the Michigan State Horticultural Society for the next 35 years, becoming "Mr. Horticulture" to many Michigan fruit growers.


Donald Hootman

He had a wonderful memory for names. He kept a card file of members of the Society, reviewed it daily during the week prior to the annual show, then stood at the door and greeted everyone by name as they entered. According to his colleague, **H. P. Gaston**, he was a very good organizer, and would pick up an idea from one farm and leave it at the next. His contributions included cooperative research with entomologists in evaluating the need for cross-pollination in tree fruits, and demonstrating that cropping of most apple cultivars improved when appropriate pollinizer cultivars were interplanted. His contributions in extension are noted in that section. Hootman retired in 1959.

Three other men who were to make major contributions to Michigan horticulture were appointed in 1920-1921 (see research section for details). **Roy E. Marshall**, a native of Nebraska, earned a Ph.D. at the University of Minnesota and joined the faculty at MAC in 1920. He was instrumental in developing methods of refrigerated storage of apples, processing of apple juice, fruit and vegetable dehydration, processing of cherries, and blanching of vegetables. He was appointed Assistant Director of the Agricultural Experiment Station in 1950, and served in that capacity until his retirement in 1957, when he became Secretary-Treasurer and business manager of the American Society for Horticultural Science.

Stanley Johnston ('20), who was Director of the South Haven Experiment Station from 1921 until his death in 1969, made the crosses that produced the "Haven" series of peaches, and laid the groundwork for Michigan's blueberry industry.

In the 1930s, **Newton E. Partridge** introduced a new method of pruning 'Concord' grapes ("balanced pruning"), a procedure described in Michigan AES Spec. Bul. 141 in 1937. He, together with **Carter Harrison** in the Department of Field Crops, also worked on orchard soil management. They observed severe erosion in peach orchards under clean cultivation, and demonstrated the beneficial effects of using a grass sod.

New Horticulture Building Needed. In their annual reports, Horticulture chairmen had been complaining for years about the poor facilities in the Horticulture Building. In 1921 **Halligan** wrote, "Our cold storage system has gone to pieces and the building itself is in such poor condition that it does not seem feasible to expand the money request to repair our old cold storage system." The Department had outgrown the old building, and more greenhouse space was needed for teaching and research.

Although MAC **President Snyder** had requested funds in 1914 from the State Board of Agriculture for a new Horticulture Building and greenhouses "as soon as possible," little action occurred until **David Friday** took office as President in 1922. The son of a fruit grower near Benton Harbor and an economist by training, Friday believed that Michigan should shift from its emphasis on wheat toward higher value crops, such as fruits. He noted that fruit-growing "is one of the lines of agriculture in which we ought to excel... yet the superior methods of production and marketing on the Pacific coast have enabled these farmers and growers to invade even Michigan herself." In fact, the number of bearing apple trees in Michigan had declined 50% and bearing peach trees 75% within the first two decades of the century (**Kuhn**, p. 28). President Friday therefore took several actions to improve the Department.

Horticulture is Divided and Gardner Takes Over. In 1922 the Department was divided into Landscape Architecture and Horticulture. Halligan was named chairman of the Department of Landscape Architecture and **Victor R. Gardner** ('05) was recruited from the University of Missouri to chair the Department of Horticulture.

Harold Lautner, '25, who succeeded Halligan as Head of Landscape Architecture in 1946, was among Halligan's first students following formation of the new department. He later commented that Halligan's lack of qualifications prevented the Department from being accredited by the American Society of Landscape Architects. "His first and perhaps only love was for plants... his training, experiences and interests did not encompass many elements of the evolving field of Landscape Architecture ... [such as] ... architectural relationships of buildings, land use, roads, traffic and many other such problems."

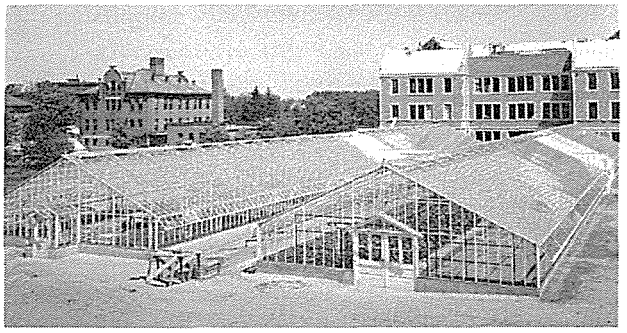
Gardner, a native of Ann Arbor, had completed an M.S. at Iowa State College in 1907, and been professor of horticulture at the University of Maine, Oregon State University, and the University of Missouri. His conditions for taking the position of Department Head at MAC had been (1) construction of the new building,

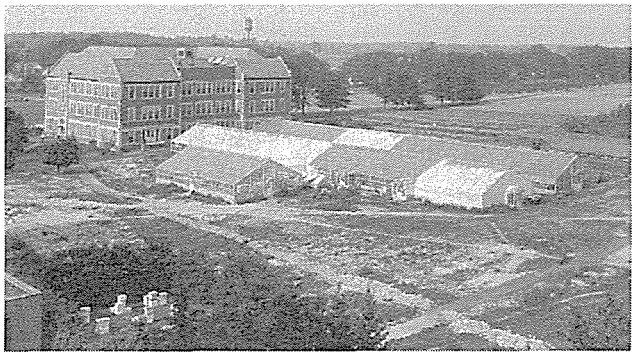
(2) additional staff, and (3) appointment of **F. C. Bradford** as a professor. All were granted. The impacts of a new Department Head, the new building and greenhouses, the increase in staff, and a Ph. D. program combined to create a burst of renewed activity in research, teaching, and extension. **Gardner** was to remain in this position for the next 23 years and served as President of the American Society for Horticultural Science (ASHS) in 1929.


Victor R. Gardner

In 1921, Horticulture had five faculty members, including **Halligan** in landscape design. A year later Gardner presided over a teaching staff of ten. **President Friday** requested $400,000 for the Horticulture building and adjacent greenhouses (16,000 square feet) from the 1923 legislature. Construction began in 1924 and the new 3-story building – then the finest horticulture building in the nation – was dedicated in February 1926 and occupied the same year. In addition to offices for faculty and staff and eight classrooms, the building had a large auditorium, well equipped laboratories, a floral design room, a seminar room, a small library and several walk-in coolers. Adjacent to the building was a range of modern greenhouses, and a large area to the east of the building was set aside for the Horticulture Gardens.

The new building was well designed for its time, and was the largest on campus to be occupied by a single department, if one disregards Halligan, the single professor in Landscape Architecture. Of the many buildings constructed on campus at this time, Horticulture was reportedly the only one built within budget. **G. J. Stout**, writing in 1976, noted that his experience as an undergraduate in ridding the old building of rats proved useful in the new building in caring for the rats used by **J. W. Crist** in studies on the nutritional value of salad greens.


Horticulture Building and greenhouses, 1920s.



An interesting amenity to the building was the "Horticulture Halls of Fame." The faculty selected 40 famous horticulturists to be honored by having their names on brass plaques. On the first floor were Michigan men who had contributed most to horticulture, on the second were those from the United States at large, and on the third were those who had made the most significant contributions to international horticulture. L. **H. Bailey** easily qualified for all three floors, but his plaque appeared only on the third. The names and accomplishments of these men are given in Appendix 3.

Course Offerings. At President Friday's urging, distinct graduate courses were introduced, and seven departments, including Horticulture, began offering the Ph.D. The degree had not previously been offered by the College, hence this change enhanced the status of the seven departments considerably. The first student to earn the Ph.D. in Horticulture (1927) was **Howard Dexter Brown**, whose thesis topic was "Effects of paper wrapper on the physical and chemical properties of fresh horticultural products." The number of graduate assistantships in the College of Agriculture was increased from 4 to 23. Graduate study by staff was limited to vacation periods, but this rule was abrogated, given the number of staff with only a B.S.; in 1923-24 about one-fourth of the graduate students were full-time staff members.

In 1925-26 MSC offered five courses of study in agriculture: General Agriculture, Horticulture, Landscape Architecture, Agriculture Business and Marketing, and Agriculture and Veterinary Medicine. The Horticulture curriculum consisted of 15 undergraduate courses (Systematic Pomology, Systematic Olericulture, Applied Plant Breeding, Vegetable Forcing, Commercial Floriculture, Herbaceous Crops, Advanced Pomology, Geography of Horticulture, Commercial Horticulture, Vegetable Gardening, Small Fruits and Grapes, Plant Propagation, Truck Farming, Spraying, and Fruit Handling). Three graduate courses were offered: Special Investigations, Methods of Horticultural Research, and History and Literature of Horticulture. The newly formed Landscape Architecture Department under Halligan offered six courses (Elements of Landscape Architecture, Landscape Architecture, Rural Landscape Design, Landscape Art, Elements of Civic Design, and Landscape Design).

New Faculty. In 1923, under **Gardner's** direction, new faculty members were appointed in addition to **Bradford: W. C. Dutton, H. A. Cardinell** and **H. M. Wells**, responsible for techniques for insect and disease control; **E. P. Lewis** in vegetable crops; and **G. E. Starr** in vegetable breeding. **J. W. Crist** and **H. P. Gaston** (M.S. '20) were appointed in 1924, bringing the total professional staff to 13 (Gardner, Bradford, Dutton, Cardinell, Wells, Lewis, Starr, Crist, Gaston, **Loree, Hootman, Marshall, Partridge**).

Gardner had first worked with Bradford at the University of Maine. **G. J. Stout** ('24, M.S. '26) later quoted Gardner as saying that 90% of all the new and imaginative ideas for the Department came from Bradford! H. P. Gaston noted that Bradford was considered by his colleagues to be "an ivory tower scholar;" he spoke German, French and Italian fluently, and wrote out translations for his students. Gardner later described Bradford as a "library man." An avid reader, well-known for his familiarity with the literature, Bradford often advised students to check the data on specific pages of specific books located on specific shelves in the library. One of Bradford's students, **Carl Bittner** ('26, M.S. '32), summed up Bradford as follows: "It was generally considered that Bradford was the brains of the Department though Gardner was the BOSS. It was thought that while Gardner had a mind like a steel trap, it was Bradford who was the intellectual power behind the throne." In addition, he was a skeptic, perhaps a carryover from his stay in Missouri, the "show me" state. Bittner later commented, "His [Bradford's] course in Horticultural History will never be forgotten by those who were fortunate enough to take it." But he added, "His course in propagation was less memorable."


F.C. Bradford

Gardner and Bradford had become a well-known team, as they moved together from Maine to Oregon to Missouri to Michigan. Together with **H. J. Hooker, Jr.**, of the University of Missouri, they wrote a well-researched book, *Fundamentals of Fruit Production.* This remained the standard text in advanced pomology from its first publication in 1922 until the last revision in 1952. (At the time of his death, Bradford was writing a book on the history of horticulture. His widow gave **H. B. Tukey** several large boxes of handwritten notes on horticulture in many countries, including Persia and Egypt, and on famous horticulturists.)

Unfortunately, Bradford lost his ability to speak above a whisper, and moved to Beltsville, Md. in 1938 to work with the USDA. The ornamental 'Bradford' pear is named in his honor.

John Crist, a graduate of the University of Nebraska in Botany, was highly regarded as a teacher. Gardner reported that former students often commented on how stimulating they found Crist's lectures. One of them (Gaston) reported that Crist held seminars once a week, and that attendance was obligatory. He was a "technical scientist," with expertise in organic chemistry and microbiology. Despite his skill as a teacher, he delighted in using technical terms that "absolutely no one understood."

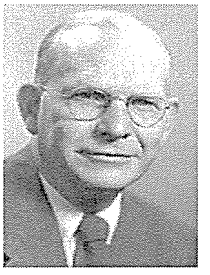

J.W. Crist

Harold Gaston (M.S. '26) lived in South Haven and worked in this area of the State on several aspects of fruit production, and, later, mechanical harvesting. His wife, **Lois,** was a champion archer. They once put on a demonstration at a Departmental party, the final act being shooting an apple off Don Hootman's head. At this point, members of the audience were getting a bit nervous, but at the last moment the Gastons pulled out a cardboard figure with "DON HOOTMAN" written on the chest. Lois then proceeded to split the apple down the middle.

Glenn Ricks (M.S. '33), from rural Oklahoma, came to Michigan State College (the name was changed from MAC to Michigan State College or MSC in 1925) as a candidate for the M.S. He had wrestled as an undergraduate at Oklahoma State. When the MSC wrestling coach quit shortly before the beginning of the season, Ricks coached the team for a year. On completing the M.S., he continued on the Horticulture faculty.

One of the procedures that Ricks and Gaston introduced was the "thinwood" method of pruning (see research section). After only a few years in the Department, Ricks accepted a job with the John Bean spray equipment company in Lansing, where he advanced rapidly. This was a period of change in sprayer equipment, as growers switched from high-pressure handguns to air-blast sprayers. Ricks worked closely with growers in developing new techniques, becoming well known in the industry as "Mr. Speed Sprayer."

Clive E. ("Cy") Russell ('26) joined the faculty in 1937, and was very popular as both teacher and friend, inviting students to his home for meals and discussions. His memory for names was legendary; he often greeted alumni by name despite years of separation. He taught introduc-

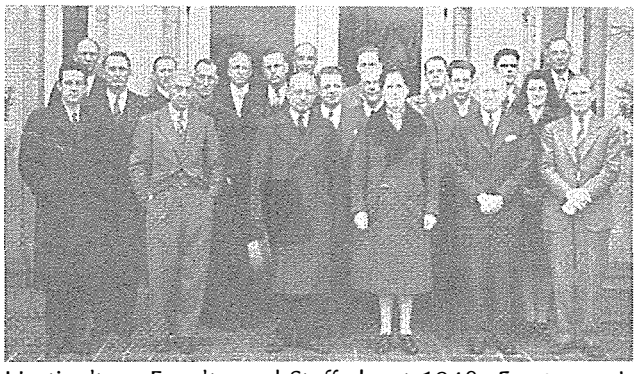

Clive E. Russell

tion to horticulture and pomology courses for 24 years, retiring in 1961.

E. H. Lucas fled Austria with his wife and two sons after the Nazis occupied that country. Poultry professor **John Hannah** had met him at a congress in Leipzig in 1935, and when Lucas applied for a position, Hannah hired him as a research assistant. Lucas subsequently transferred to the Horticulture Department. He had earned a doctorate in agriculture in Vienna, but considered it insufficient, so he completed a Ph.D. in Botany at MSC while conducting research in horticulture. Much of his research (see research section) dealt with medicinal properties of plants.


E. H. Lucas

The Emergence of Floriculture. Most of the courses taught and the research conducted in the latter half of the 19th Century dealt with fruit and vegetables, as these were the most profitable horticultural crops in Michigan. Floriculture and ornamental gardening were also taught, but mostly as hobbies. In a speech delivered to the Adrian Farmer's Club in 1876, **Charles Garfield** spoke of the "Importance of Floral Adornments" around the farm. Because farmers of the time were "too busy" to pay attention to the appearance of the farm grounds, he proposed that women and children garden to both beautify the farm and provide exercise. In a similar address at the Manchester Institute in 1875, **Mrs. R. D. Palmer** stated, "There has been great improvement in floriculture in the last forty years. When I think about pansies when I was a child, although they looked very beautiful to me then, yet they weren't half as large as now, nor of as many colors."


Horticulture Faculty and Staff about 1940. *Front row,* L - R: K. Barrons, J. Kremer, V. R. Gardner, I. Felber, R. Marshall, C. E. Russell. *2nd row:* ___, O. Brown, ____, P. Krone, _____, J. Moulton, ___. *Back row:* ___, E. Lucas, ___, C. Wildon ?, ___, ___, ___, ___.

Improvement in floriculture had indeed occurred, but little mention of it was made at MAC. In 1905, only two of the 15 courses offered in horticulture (Floriculture and Vegetable Forcing, and Floriculture for Women) dealt with floriculture.

In 1920 two floriculture courses were being taught. Greenhouse Industry was required of juniors in landscape gardening, and dealt with the "location, capital required, and opportunities in floriculture and vegetable forcing, greenhouse construction, heating systems, and thorough consideration of all common greenhouse crops, including ornamentals and vegetables." Landscape Gardening and Floriculture was offered as an elective for Home Economics majors. Lectures covered the principles of planting home gardens and plant selection, and the outdoor lab provided "practical work in propagation and care of house and florists' plants."

Following its formation in 1925, the new Department of Landscape Architecture offered courses in landscape gardening, and **Prof. Gunson** taught the only Horticulture course related to floriculture – Greenhouse Management. Later new floriculture courses became available, thanks to the increasing popularity of growing flowers and the efforts of several professors, including **Kenneth Post** ('24), **Gustave "Gus" Poesch,** and **Alex Laurie**. (According to legend, Laurie, Post and Poesch discovered the commercial benefits of photoperiodism; see research section).


Kenneth Post


Alex Laurie

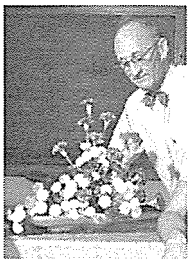
In a 1925 report to the Michigan Board of Agriculture, **Gardner** spoke of the newly built greenhouses and the possibility of using the facilities for more floriculture lab work. During the next several years, an increasing number of students asked to study floriculture, and a short course in commercial floriculture was offered for the first time.

Gardner must have been dissatisfied with the Department's organization, for in 1924 he changed its structure again. The major now consisted of three concentrations: general horticulture, vegetable gardening and floriculture, and pomology. **John Crist** and Alex Laurie taught two new courses – Commercial Floriculture, and Herbaceous Crops. In 1926, Flower Growing ("the use and culture of flowering and other ornamental plants in the home and garden") was added to the curriculum as an elective taught by Laurie, and in 1928 three more courses were added, viz., Outdoor Floriculture, Floral Arrangement, and Conservatory Plants. In addition, the year-long Com-

mercial Floriculture class became three one-term courses: Greenhouse Construction and Management, Flowering Greenhouse Crops, and Outdoor Floriculture. All courses except Flower Growing were required for vegetable-floriculture students.

Floriculture continued to gain in popularity, and in November of 1929 the student horticulture club and the Michigan State Florists Association collaborated in presenting the "largest and best horticulture show ever held in central Michigan" in Demonstration Hall on campus. As the new decade began, the number of students enrolled in floriculture had increased to half the number in pomology, with vegetable gardening following close behind.

In 1929 **Carrick Wildon** replaced **Laurie,** who had moved to Ohio State. He had earned B.S. and M.S. degrees from Massachusetts Agricultural College and had been an Assistant Professor of Horticulture at Rhode Island State College for 8 years. In addition to his teaching responsibilities, he served as secretary or vice-president of several state and national dahlia societies. He taught most of the floriculture and greenhouse classes until he retired in 1965.


Carrick Wildon

Paul R. **Krone** joined the Department as floriculture extension specialist in August 1929, and retired in April 1965 – nearly 36 years of service. He authored many research reports and marketing studies, and wrote numerous columns and articles for trade journals. He received awards for his lectures and publications on the care and handling of roses and gladioli, floral arrangement, and other topics. He chaired the committee responsible for planning the plant science greenhouse complex, was instrumental in obtaining industry support for the appropriations for construction of the complex in 1949-50, and coordinated operations there. In 1959, he became executive director of Roses, Inc., an international trade association operated by growers, and continued in this capacity until 1971, when his son **James Krone** was appointed to this position. Paul served as executive vice president of the Michigan State Florists' Association, and was managing editor of their official publication "The Michigan Florist." In addition, he was executive secretary of the Michigan Gladiolus Society, the Michigan Dutch Bulb Growers Association, and the Michigan Peony and Iris Society. He served on the boards of several societies, including the Michigan Retailers Association. Krone was named to the Florists Hall of Fame by the Society of American Florists in 1965, when 800 persons attended a testimonial dinner in Detroit.


Paul R. Krone

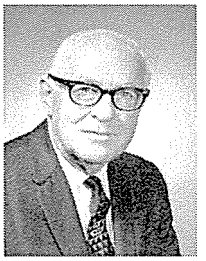
Food Supplies During WW II. Concern about the supply of food arose during the war. In 1943 the Michigan Defense Council appointed Krone director of the Victory Garden program in the State. Seeds and information were supplied to the public to encourage home gardens. In the same year **Henry Ford** provided funds for a cannery to be erected on the north bank of the Red Cedar River, near the present site of the Hannah Administration Building. W. E. **Robertson** had worked in commercial processing plants in New York State before coming to MSC in 1943. In 1944 he supervised the processing of 75,000 gallons of vegetables, produced by the Horticulture Department on 200 acres of campus land, to supply dormitory kitchens. In 1947 **Roy Marshall** was responsible for the canning operations. In the same year three Horticulture courses in fruit and vegetable processing were initiated.

Food Technology Section. As the Department grew, specializations developed among groups of faculty, one group consisting of food technologists. By 1957, Robertson and three other faculty members, **Glenn Lundeen, Clifford L. Bedford,** and **Frank McArdle,** comprised this section. In the fall of the same year, **Georg Borgstrom,** of the Swedish Institute of Food Preservation Research in Goteburg, joined the Horticulture Department to direct the program in fruit and vegetable processing.

In 1958 the old Dairy Building was remodeled for use by faculty in Food Technology and Agricultural Chemistry, and on May 1, 1960, these professors, along with faculty from other departments, formed the new Department of Food Science. This temporarily relieved crowding in the Horticulture Building.

A New Hand at the Helm

In 1945 a new hand took the helm of the Department. **Gardner** had served as Department Head since 1922 and as Director of the Experiment Station since 1928. Although he retained the latter post until 1949, when **C. H. Hardin** became Director, Gardner now turned over the duties of chairing the Department to **Harold Bradford Tukey.** Tukey had held several positions at the New York State Agricultural Experiment Station


H. B. Tukey

in Geneva beginning in 1920, and had obtained a Ph.D. in 1932 under the direction of **E. J. Kraus** at the University of Chicago.

Tukey had a wide range of interests. In work at Geneva he had investigated size-controlling apple rootstocks, development of the fruit and embryo of peach and cherry, and use of embryo culture to obtain seedlings of early-ripening stone fruits. He and coworker **Charles Hamner** were among the first to demonstrate the herbicidal activity of 2,4-D, and Hamner came with him to East Lansing.

These interests, together with his international contacts and his speaking and writing abilities, helped make his tenure a productive period for the Department. Many of the students who earned graduate degrees during this period became leaders in research, teaching and extension at other universities. He made many contacts in his travels and brought prominent scientists to campus for lectures and sabbatical leaves. He wrote articles for trade journals, including a regular column for the *American Fruit Grower*, as well as for magazines and scientific journals. He had a gift for explaining complex concepts in simple terms. He was to serve as President of the American Pomological Society, the American Society for Horticultural Science, and the International Society for Horticultural Science, of which he was one of the founders, and was elected a fellow of both of the latter two organizations. He was editor of the *Proceedings of the American Society for Horticultural Science* for some 21 years. In 1996 he was named to the Hall of Fame of the American Society for Horticultural Science.

Tukey established strong relationships with the horticulture industry and was receptive to grower needs. In response, grower organizations provided support for funding of research by the State legislature. In addition to his academic duties, he served as Chair of the University Athletic Council in the 1950s. An article about him in the *MSU Reporter* (Big Ten Representative, October 1957) concludes with the suggestion, "If you haven't already met Dr. Tukey, just introduce yourself to the first gentleman you see carrying a basket of apples, a portable typewriter, and a football."

Mrs. **Marian Barrett**, who was Dr. Tukey's secretary at Geneva, came to E. Lansing to work a year before Tukey himself arrived. She laid the groundwork for his arrival and continued as head secretary in the Department. She is remembered as a stern guardian of the stockroom; students (and professors) had to ask her permission to obtain pencils, paper and other supplies.

Returning Veterans Expand Enrollment. Tukey assumed his new responsibilities at a time of major change at MSC as World War II ended and veterans crowded the campus. College enrollment had reached a maximum of 6776 students in 1940, then dropped, as men and women of college age served in the military. With the end of the war in 1945, returning veterans entered or re-entered the College in droves. In September of 1946, 8265 men and women veterans came to MSC, resulting in a total enrollment of over 13,000. By 1950 the appointment of new faculty and staff had more than doubled the size of the Horticulture faculty, increasing it from 16 to about 36. Professors and instructors appointed between 1945 and 1950 included **W. W. Aldrich, R. F. Carlson** (M.S. '49, Ph.D. '52), **S. H. Wittwer, R. L. Carolus, H. L. R. Chapman, A. L. Kenworthy,** A. E. **Mitchell, G. M. Kessler** (Ph.D. '53), **J. S. Titus, D. P. Watson,** A. **L. Isbet,** E. **P. Roberts** (M.S. '42; Ph.D. '58), **H. Davidson** (M.S. '53; Ph.D. '57), **F. L. S. O'Rourke,** W. **J.** Haney, **and A. N. Reath** (M.S. '53).

In response to the massive influx of veterans, the College initiated its first new construction since 1929. Enrollment in Horticulture short courses doubled. A Commercial Floriculture course was added in 1947, and the two-year commercial training program in Nursery and Landscape Management, coordinated by Steve O'Rourke, was first offered in the fall of 1948. Both courses included one year of class work on campus and either 6 months or one year of placement training. A short course for processors was added in 1956, and a vegetable short course of 8 weeks in January-February 1958.

Renovations to the Horticulture Building. When the Department of Landscape and Urban Planning moved to new temporary buildings on South Campus in the late 1940s, the space vacated was converted to biochemical, morphological, and biophysical labs, and additional changes were made. The State Legislature appropriated $150,000 for equipment and facilities, including new greenhouses and an "inexpensive farm structure to house fruit handling, common storage and spraying." Over the next few years, several classrooms were converted to research laboratories, each with an adjoining faculty office The entire west end of the 3rd floor was converted to laboratory space, aside from the large room on the south end for graduate students. Much of the fruit handling room on the west side of the ground floor was transformed into small cold storage rooms for research in post-harvest physiology.

Horticultural Therapy Program. Donald P. Watson became a faculty member at MSC in 1948, following completion of a Ph.D. at Cornell University. His research interests centered around plant anatomy/morphology, and he equipped a laboratory for this purpose. In addition he initiated a horticultural therapy program, and co-authored, with **Alice Burlingame** of Pontiac State Hospital, the text *Therapy Through Horticulture*. Burlingame offered 1-week courses in horticultural therapy at MSC in the early 1950s. The curriculum was designed to instruct students in how to use plants for therapeutic (but not medicinal) purposes in helping persons with mental and physical disabilities. The program ceased with Watson's departure for the University of Hawaii in 1964.


Donald P. Watson

In 1973 **J. Lee Taylor**, in cooperation with **Eleanor McCurry**, also of Pontiac State Hospital, reinstituted the program. On joining the staff in 1974, **Patricia Erwin** worked with Taylor in developing new courses. The students did volunteer work at local institutions to gain experience in pediatrics and geriatrics, and with the mentally impaired. They subsequently took jobs in new horticultural therapy programs at these institutions. However, many of these positions were eliminated when funds were reduced in 1984. In addition, graduates had to compete with occupational therapists, making jobs difficult to find. Therefore the program was again discontinued.

New Plant Science Greenhouses. In 1949 a legislative appropriation provided funds for a new greenhouse range at the corner of Farm Lane and Wilson Road. Fourteen houses with a total area of 57,000 ft.^{2} were constructed for use by the Departments of Horticulture, Botany, Entomology, Farm Crops, and Soil Science and for the USDA/ARS sugar beet research program, and the complex was dedicated in January 1950. Eight of the houses were assigned to floriculture, approximately trebling the area available for plant research under glass. Additions were made in 1958 (5582 ft.^{2}) and 1963 (1584 ft.^{2}). **Frits Went** of the California Institute of Technology considered the complex to be the finest controlled environment facility in the United States in the early 1950s.

New Faculty. Many new faculty members joined the Department in the period from 1951 to 1956, including **D. H. Dewey** (post-harvest physiology), **R.P. Larsen** (Ph.D. '55) and **M. J. Bukovac** ('51, M.S. '54, Ph.D. '57) (pomology), **J. D. Downes** (Ph.D. '55) and **S. K. Ries** ('50) (vegetable crops), **R. Lindstrom and R. F. Stinson** (floriculture), **S. Honma, C. E. Peterson** (vegetable breeding), and **F. B. Widmoyer** (Ph. D '54) (ornamental horticulture). Larsen served as educational coordinator for the Michigan State Horticultural Society from 1955 to 1968, when he accepted an appointment as Superintendent of the Tree Fruit Research Center, Washington State University, at Wenatchee.

Groundbreaking for new range of greenhouses, 1949.
Left to right: Charles Figy, Director, Michigan Department of Agriculture; H. B. Tukey, Chair, Department of Horticulture, MSC; __ Kohn*: ___ Watson*; ___ Heach*; ___ Ward*; Dean Anthony, College of Agriculture, MSC; ___ Farley*; ___ Toonan*; P. Krone, Department of Horticulture, MSC.
* Representatives of State farm organizations.

New greenhouse range, 1949.

Chapter 1.3

People and Programs. Part 3 (1956-2005)

Instruction in Landscape Horticulture. Clarence E. ("Clancy") Lewis, then a member of the faculty at the New York State University of New York at Farmingdale, Long Island, was originally recruited to teach landscape horticulture in the Department of Landscape Design and Urban Planning in 1957. In 1958 he moved to the Horticulture Department, where he began teaching identification and use of woody landscape plants. His courses attracted both majors and non-majors, and his appreciation for the beauty of shrubs, trees, opening buds, and bark patterns, together with his skill with a 35-mm camera, were to make him much in demand on the lecture circuit. (See Gardens and Arboretum section.)


Clarence E. Lewis

First TV and Evening College Programs. A weekly TV series on gardening, produced by **Donald Watson** with support from the Michigan Association of Nurserymen, was inaugurated in 1960, and an evening course in gardening was offered for the first time in April of the same year, with seven professors participating.

Carew Becomes Chair. When **Harold Tukey** retired as Department Chairman in 1962 after 17 years of guiding the Department through a period of very significant growth and development, **H. John Carew** was named chairman. Carew had earned a Ph.D. at Cornell University and had served in the U.S. Army during World War II. An extrovert with a contagious joie-de-vivre, he had excellent rapport with staff members, students, and growers, and wrote a monthly column ("As It Seems to Me") in the *American Vegetable Grower* for many years.


H. John Carew

In his years at MSU, Carew made many important contributions to horticulture in Michigan, the nation and the world, as a vegetable extension specialist, teacher, writer, speaker, and leader. He served as president of the American Society for Horticultural Science, and received the Distinguished Alumni Award from Pennsylvania State University and the Distinguished Service Award of the Michigan State Horticultural Society.


Student watering plants.

During Carew's tenure, members of the post-war "baby boom" reached college age. This coincided with a renewal of interest in nature, resulting in the "back-to-nature movement," and increasing enrollment in all areas of agriculture. The number of undergraduates majoring in horticulture rose from 78 in 1968 to 526 in 1978, requiring adjustments in allotment of faculty time and use of facilities. TV tapes and slides provided visual aids that encouraged independent study.


J. Lee Taylor

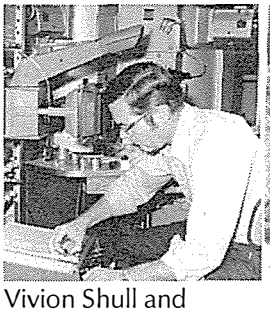
Curriculum Changes. Major curriculum changes were made in 1965; 30% of the courses with low enrollment were dropped or combined. However, enrollment in Indoor Plants and Flowers, taught by **J. Lee Taylor**, reached 250, making it one of the largest horticulture classes on record, and reflecting the growing American interest in gardening. In 1972 it was voted the most popular course in the College of Agriculture and Natural Resources Enrollment continued to grow, eventually reaching 500 in each of three quarters, and requiring 10 teaching assistants. In the 1980s budget cuts necessitated dropping some courses for non-majors, and this course was discontinued despite its popularity.

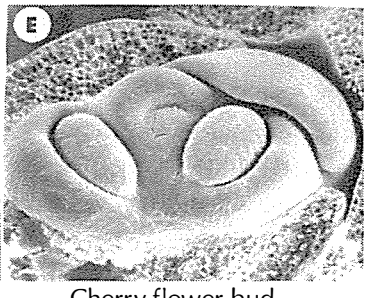
Space Limitations. By the mid-1960s, space was again at a premium, and **August ("Gus") De Hertogh, Kenneth Sink, Shigemi Honma,** and **Larry Baker** joined Dairy Science faculty members in the basement of Anthony Hall. Following completion of the Pesticide Research Center in 1970, **Stanley Ries** and **Alan Putnam** occupied laboratories there. Thus, the problem of space was solved at the cost of placing Departmental faculty in three widely separated buildings.

New series of monographs initiatied. "Fruit Trees – Dwarfing and Propagation," by **R. F. Carlson,** the first of a series of horticultural monographs entitled "Horticulture Reports," was published by the Department in December 1966. In this same year, the publication of bound copies of the Departmental annual report was initiated. This continued until 1986, when budget restrictions eliminated publication.

Electron Optics Facilities Added. H. Paul Rasmussen (M.S. '62, Ph.D. '65) joined the Horticulture faculty in 1966, and raised funds for the purchase by the University of an electron microprobe x-ray analyzer (MP), which allowed the identification and measurement of numerous elements in an area a few micrometers in width. This could be used to map the distribution of elements in the specimen and to provide images of the surface. The instrument was installed in the Horticulture Building, and Rasmussen was responsible for its use, assisted by **Vivion Shull.** The microprobe was used for many purposes, from the analysis of the mineral content of rock samples by geologists to the measurement of calcium levels across leaf abscission zones. Its location in the Horticulture Building made Horticulture professors and students more conscious of its value as a research tool, and stimulated a surge of interest in both electron microprobe analysis and scanning electron microscopy, as witnessed by numerous publications based on these techniques.


H. P. Rasmussen


Vivion Shull and microprobe.

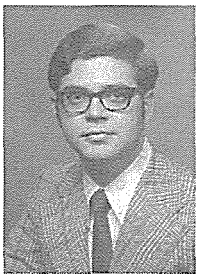

Cherry flower bud.

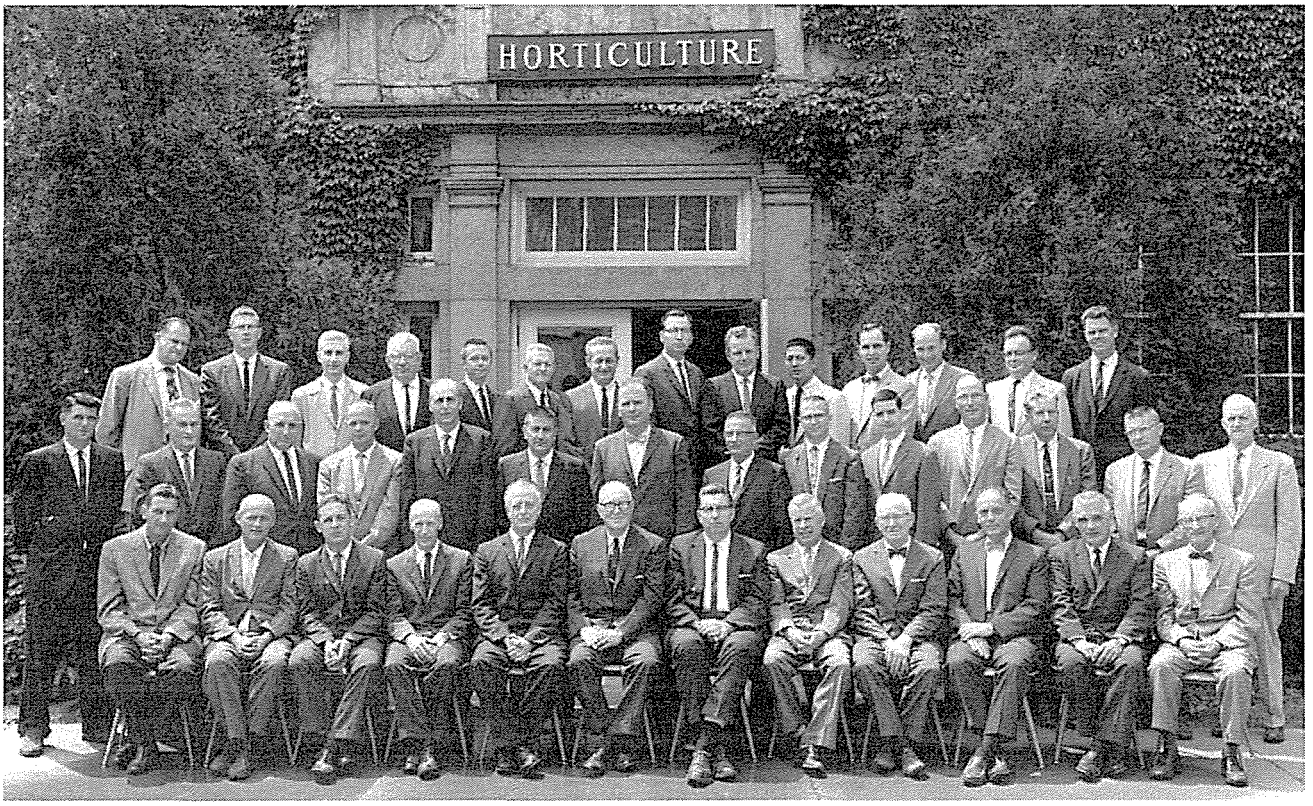
Rasmussen later chaired a committee to add a scanning electron microscope (SEM), to be housed in the Pesticide Research Center, and all of the instruments collectively became known as the Electron Optics Laboratory. He moved to Washington State University in 1981 to become Chairman of the Horticulture Department there.

Increasing Enrollment Requires Attention. As enrollment in Horticulture rose in the 1970s, faculty members were overwhelmed with the task of advising students. To reduce the pressure on them, **Patricia Erwin** ('73) who had grown up on the family fruit farm in South Lyon and had spent a year as an agricultural missionary in Ecuador, was hired to serve as advisor to beginning students in 1974; she remained in that position for 25 years. Erwin provided information to new students and advised them during the initial phases of their studies. Once the students had decided on a specialization – vegetable crops, floriculture, pomology, landscape horticulture – they were assigned to a professor in that area. In advising students, she realized that many of them needed practical experience in order to decide on a specialization, so she began teaching an introductory class for freshmen to expose them to practicing horticulturists through guest lectures and field trips. In addition, she assisted with the internship program (see below).


Patricia Erwin

"Clancy" Lewis retired in 1972, when student numbers were mushrooming. His replacement was **Ronald Spangler** (M.S. '68, Ph.D. '71) who was then an Assistant Professor in Nursery Crops at North Carolina State University, Raleigh. By this time enrollment in the introductory woody ornamental courses – HRT 211 and 212 – had grown from 100 per term to 300, and would eventually reach 350. Some applicants for the position had confided to **Carew** that 100 students was the maximum number that could be taught in such a course. Spangler obtained help from **Steve Yalon** in the Teaching Development Office, who assured him that these numbers could be handled "with the proper attitude and hard work." Ron met the challenge by scheduling 18 lab sections, staffed by 11 undergraduate teaching assistants, each term. When Agricultural Technology students were included, the number of students grew to 450, with 22 laboratory sections.


Ronald Spangler



Horticulture/Food Science Faculty and Staff, 1962.

Seated, left to right: A.E. Mitchell, A. L. Kenworthy, S. H. Wittwer, D. H. Dewey, R. L. Carolus, H. B. Tukey, H. J. Carew, C. L. Hamner, R. E. Marshall *, H. P. Gaston, D. P. Watson, C. E. Wildon.

Standing, front row: R. Lindstrom, C. E. Mullett, L. E. Tompkins, R. F. Carlson, C. L. Bedford, D. Markarian, R. R. Dedolph, C. E. Lewis, J. L. Taylor, R. B. Rutland, S. K. Ries, J. E. Moulton, C. E. Peterson, H. A. Cardinell *.

Back row: G. A. Borgstrom, D. R. Dilley, P. Markakis, F. L. S. O'Rourke, L. D. Brown, J. D. Downes, G. M. Kessler, R. P. Larsen, H. K. Bell, S. Honma, M. J. Bukovac, R. F. Stinson, G. A. Lundeen, H. Davidson.

Additional faculty, not present - F. Freeman, W. J. Haney, S. Johnston, P. R. Krone, L. J. Tolle, D. D. Juchartz, C. E. Russell *, H. L. Chapman *, H. D. Hootman *, K. D. Bailey *, W. Toenjes * [* Retired]

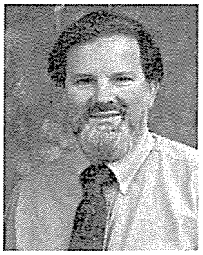
Institute of Agricultural Technology Replaces Short Course System. The Department of Short Courses became a new division in the College– the Institute of Agricultural Technology (IAT) – in March 1967. Programs in Horticulture included Landscape Nursery, Commercial Floriculture, Fruit Production, and Vegetable Production. Because of low enrollments in Fruit Production in the late 1970s, students attended classes for 4-year pomology students; the option was subsequently terminated.

In 2004 only two horticulture programs in IAT (Landscape and Nursery Management, Viticulture and Enology) were being offered on campus, and two (Applied Plant Science, and Landscape Management) off campus. The Landscape and Nursery Management program consisted of two 15-week semesters and one 9-week seminar plus an internship, for a total of 48 credits. Approximately 20 students took the course each year. The Viticulture and Enology program, discontinued in 2005 because of low enrollment, combined classroom lectures with year-round field experience, including interaction with managers, employers and consumers. It contained two options – Viticulture and Enology. The former was a one-year program emphasizing vineyard management; the fall and spring were spent on campus, the summer on internship for a total of 33 credits. The latter was a 16-month program emphasizing wine production and winery operation, and began in August. Lectures were included each semester. The course totalled 36 credits, including internship.

In 2005 Landscape Management was taught as a satellite program with Grand Rapids Community College (GRCC), and students could earn an associate degree from GRCC. The Applied Plant Science Program was available through four community colleges – Northwestern Michigan College at Traverse City, Lakeshore at Scottsville, Kirtland at Roscommon, and North Central Michigan at Petoskey.

In addition to teaching these courses, **Spangler** advised 150 undergraduates and several graduate students, and coordinated the internship program for ornamental horticulture. This involved placement of over 100 students and monitoring their work in locations as far away as Florida and Georgia. Ron resigned in 1979 to pursue a master's degree in Landscape architecture at Ball State University.

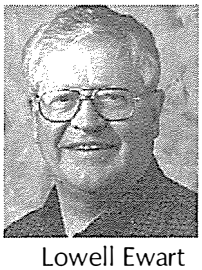
The plant identification courses were taught briefly by **Sueanne Layden** on Spangler's resignation, and then by **Jesse Saylor** (M.S. Botany '71), who joined the Department as home horticulture specialist in 1973. In the late 1970s Spangler had assembled 12-14 sets of slides of woody ornmental plants. Each set contained 28 trays of 80 slides each, which were available for student use in the Main Library.


Jesse Saylor

When computers became available, Saylor converted the slides to video disks, but these proved unsatisfactory; few computers were available, and just one student tied up a computer. Saylor then scanned the slides and created sets of four to six CDs. In Fall term 2004, he produced a Visual Basic program with a 6-CD set that contained over 19,000 photos viewable in three sizes, and a plant selection feature. In addition to visual images, from 15 to 20 teaching assistants were employed for on-site identification on outdoor walking labs covering north and south campus, as well as Beal Gardens.

In 2005 these courses were also being offered off-campus, with local instructors, at Traverse City and at Grand Rapids. The web site and complementary CD set will allow web-based classes to be offered in the future at locations around the State.

Flower Seed Trials. Lowell C. Ewart was Head of the Flower Seed Department and a member of the Board of Directors of Joseph Harris Co. of Rochester, N.Y., where he developed many cultivars of bedding plants widely used in the industry. He joined the Department as Associate Professor in 1977. MSU initiated a flower seed trial garden in 1978, which included an All-American Selection (AAS) trial site – one of 28 in the United States and Canada. Ewart served as supervisor of the flower seed trials and official judge for the MSU AAS trial. (See section on gardens.)


Lowell Ewart

Donald A. Dunbar ('52, M.S. '68, Ph.D. '73) taught courses in floral design beginning in 1969. He was well-liked by his students and respected by the faculty, staff and members of the floriculture industry. Don had an unusual knack for creating beauty out of whatever was at hand. When a corsage was requested for an administrator's wife, all that was available was a rather old orchid flower, but Don sprayed it with black paint, and the recipient was delighted with her unique corsage, His untimely death from cancer in 1979 was a blow to students and faculty members alike.

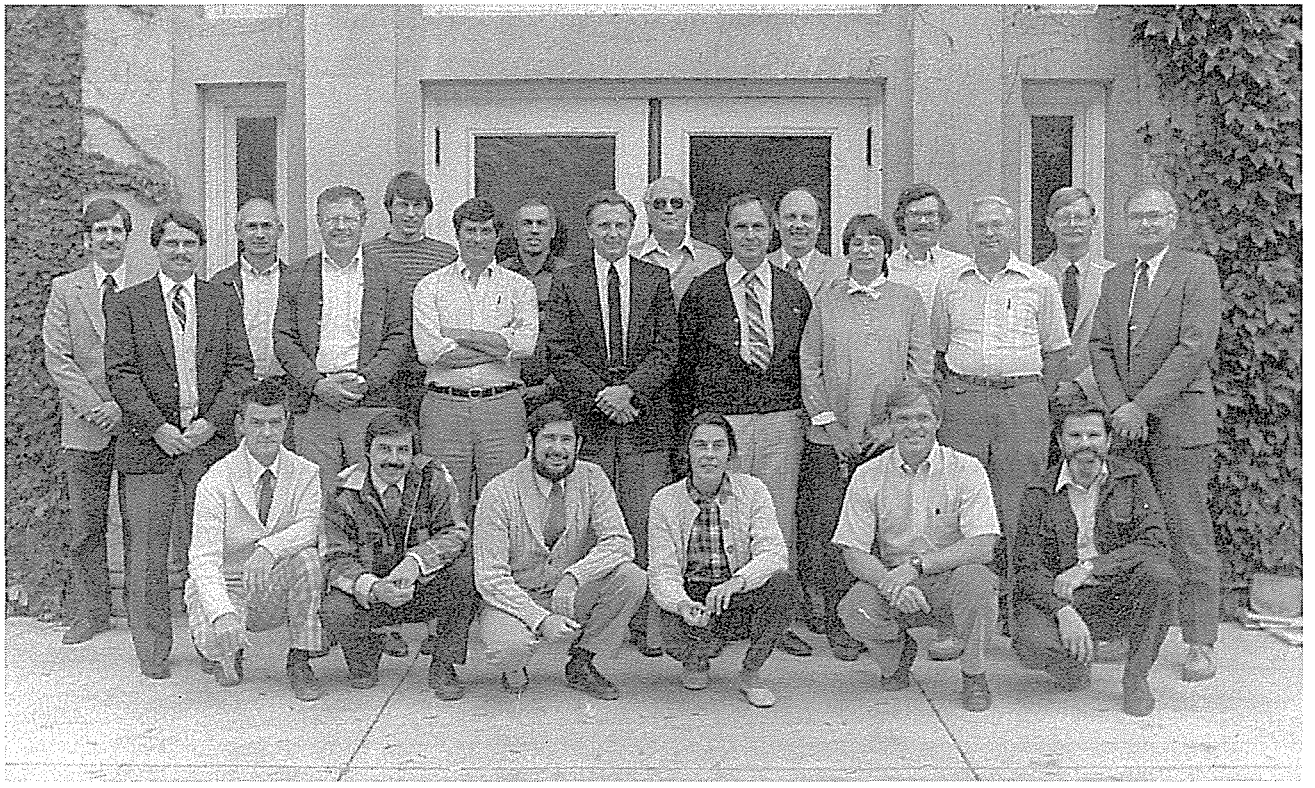

Donald Dunbar

Kelly Returns to Alma Mater as Chair. John Carew died as a result of a brain tumor on November 1, 1977 after 15 years as Chairman. **John Bukovac** took responsibility for many administrative matters during the early stages of Carew's illness. **Donald Dewey** was then appointed acting Chairman until a new chair could be found. **John F. Kelly** (B.S. and M.S. '53) was the Department's choice in 1978. After earning a Ph.D. at the University of Wisconsin in 1959, Kelly had directed Campbell Soup Company's Pioneer Research Laboratory, then moved to the University of Florida as Head of the Vegetable Crops Department.


John F. Kelly

Kelly's arrival coincided with the "microcomputer revolution" and he soon succeeded in convincing faculty and staff to develop their skills in this area. Within 10 years almost all typewriters had been replaced by computers, which faculty members have used for many purposes, including data analysis and retrieval, and access to the Internet. In addition, Kelly hired the Department's first molecular biologist, **Rebecca Grumet** (M.S. '80, Ph.D. '85), as research in this area "came of age."

The Department had a record of work in international agriculture (see international section), and Kelly's arrival coincided with the appropriation of Federal and University funds for more international involvement, particularly in developing countries. **H. C. ("Skip") Bittenbender** (M.S. '74, Ph.D. '77) became the first full-time staff member in international horticulture in 1981. He had had extensive experience in Indonesia as a graduate student, and, later, in Nigeria and Nepal. He initiated undergraduate courses in tropical fruits and vegetables, and team-taught, with faculty in Agricultural Economics, a course on agricultural research systems in developing countries. He recruited graduate students from such countries to work on projects relevant to small farm agriculture. Bittenbender moved to the University of Hawaii in 1985.



Faculty 1985

Kneeling: F. Dennis, R. Schutzki, H. C. Bittenbender, A. Iezzoni, J. Flore, J. Saylor;
Standing: I. Widders, C. Peterson, K. Sink, L. Ewart, A. Cameron, R. Herner, R. Perry, J. Kelly, S. Ries, M. J. Bukovac, W. Carlson, P. Zandstra, J. Hancock, J. L. Taylor, B. Zandstra, J. Hull.
Absent: D. Dilley., R. Heins, A. Putnam, H. Price, S. Honma.

The Plant Breeding and Genetics Graduate Program. This program was established by the College of Agriculture and Natural Resources and the College of Natural Science in 1981. The faculty engaged in plant breeding and genetics (PBG) in Crop and Soil Sciences, Forestry, Horticulture, Plant Biology, and Plant Pathology pooled talents and resources to teach courses and advise students in a unified graduate program – the first of its kind in both colleges. A budget of $60,000 was appropriated to start the program, and **Kenneth Sink**, Professor of Horticulture, was named director. He was succeeded by **James Hancock** in 2002. Funds supported a full-time secretary, outside speakers, and a seminar series. In 2005 about 20 faculty members, representing all five departments, were participating in the program, and about 35 graduate students were enrolled.

Students in the PBG program select the topic areas for seminars and nominate faculty to serve as mentors. During the fall seminar series, off-campus speakers are invited for a mini-symposium. Many non-PBG plant scientists from MSU have also participated. Students read papers published by the guests and discuss research approaches. A Research Forum Day in January includes posters and oral presentations by students and faculty on results of their research.

Horticulture and Crop and Soil Sciences Departments Move into a New Building. In the years from 1945 to 1975 there were many changes in curriculum, faculty and student enrollment.

In the 1950s through the early 1960s the curriculum was highly oriented toward fruits and vegetables, with only limited offerings in floriculture and landscape horticulture. However, as a result of the renewed interest in nature, described above, enrollment in floriculture and landscape horticulture began to increase significantly, and enrollment in fruits and vegetables began to decline. This necessitated changes in faculty assignments.

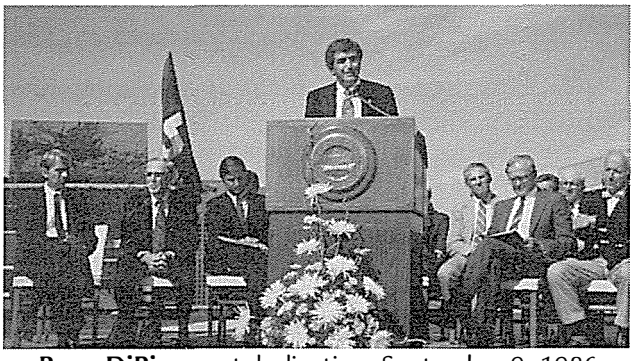
In addition, the building was over 50 years old, and the greenhouses were in need of replacement. At the same time, the Department of Crop and Soil Sciences was outgrowing its facilities in Agriculture Hall and the old Dairy Science Building. The administration decided that the best solution to these problems was to construct a new building south of the Red Cedar River, and adjacent to the Plant Biology Building, which housed both the Plant Research Laboratory and the Department of Botany and Plant Pathology.

A blue ribbon committee appointed by the Michigan State Horticultural Society and chaired by **Ed Wasem**, a fruit grower from Milan, was very helpful in obtaining a legislative appropriation for the new building. Approval and funding ($29.5 million) was received in 1983 for construction, and ground was broken the following year. In 1986 the Department celebrated the 125th anniversary of the horticulture program at MAC/MSC/MSU, and in August and September the total campus-based program in horticulture was brought together at one site as the two departments completed the long-awaited move to the new Plant and Soil Sciences Building, which was dedicated on September 9.

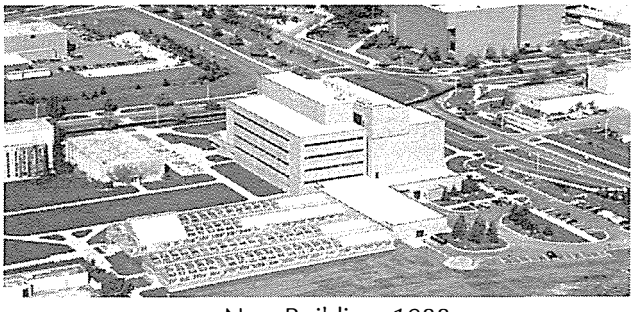
Each department had its own set of offices in the new building, each faculty member his or her own office, and a secretary with a separate office was assigned to provide secretarial service to from three to four faculty members. However, the professor in charge of a section (floriculture, fruit, landscape horticulture, vegetables) was assigned a small suite, with separate offices for the professor and two to three other offices for technicians. The Department chairperson was provided with a much larger suite that included a reception room, an office for the chairperson, a small conference room and two to three offices for secretaries. **L. H. Bailey's** desk, which had served Department chairs for 100 years, remained as the centerpiece in the chair's office.

L. H. Bailey's desk.

Groundbreaking by **Pres. Mackey**, **Gov. Blanchard,** and **Drs. Harpstead** and **Kelly**, March 7, 1984.



Pres. DiBiaggo at dedication, September 9, 1986.



New Building, 1988.

Each department had a seminar room and a mail room equipped with a copy machine. The departments shared a large reading room, a learning center, and a number of classrooms, some of which were equipped to provide for special needs, such as a drafting room for the teaching of landscape design. The building also had a large auditorium that was available for classes and special functions on a university-wide basis. Environment-controlled chambers for growing plants were available for use by the Departments. Attached to the building were a range of teaching greenhouses and a conservatory; the latter has been used for the Horticulture Club's and other organizzations' shows, as well as for meals and receptions.

Clarence E. Lewis Arboretum. In 1983 **Robert Schutzi** began to develop an arboretum in honor of **Clarence E. ("Clancy") Lewis**, who had retired in 1972 after 35 years of teaching woody ornamentals. Clancy was famous for his marvelous slides of arboreta and gardens, and was popular as a lecturer by horticultural societies. Funds and plant materials were provided by individual alumni, professional organizations, and nurserymen, and the arboretum was dedicated in 1984 (see Ch. 6).

Joint Annual Meeting of the American Society for Horticultural Science (ASHS) and the Canadian Society for Horticultural Science (CSHS) at MSU in 1988. At the invitation of the Department, the 85th annual meeting of the ASHS and the 33rd Annual meeting of the CSHS were held jointly on the MSU campus 6-11 August 1988, with over 800 oral and poster presentations plus additional workshop and symposium papers. The summer of 1988 proved to be very hot and dry; as a result the University stopped sprinkling the lawns, which turned brown for lack of water. Thanks to the

foresight of the planning committee, dual sites for meetings had been reserved, one of which was air-conditioned. (Lack of air-conditioning in dormitory rooms led to holding future ASHS meetings in hotels and convention centers!) Under **Jack Kelly's** able chairmanship the meetings were conducted with few, if any, problems.

New Horticulture Gardens and 4-H Children's Garden. Will Carlson's plans for an extensive new garden on the site of the Plant and Soil Sciences Building were met with skepticism by some of his colleagues. However, the 2-hectare (5-acre) Horticulture Demonstration Gardens, designed by the architectural firm of Johnson, Johnson, and Roy of Ann Arbor, were constructed adjacent to the new building between 1989 and 1993, and are a testament to Carlson's skills in obtaining support. Two 0.8-hectare (2-acre) sections were devoted to annuals and perennials, and 0.2-hectare (0.5-acre) each to roses and combination gardens for student projects. In addition, a 0.8-hectare foyer garden was established at the front of the building. **Jane Taylor** worked closely with Carlson in developing a unique 4-H Children's Garden adjacent to the main garden (see gardens section)

Master Gardener Volunteer Program. This program originated in Washington State in 1972 and was designed to train paraprofessionals so they could assist extension personnel in carrying out their work. In 1989 the Department of Horticulture took over coordination of the program from MSU Extension and appointed **Ralph Heiden** (M.S. '87) as the first coordinator of a state-wide program. Following Heiden as State Coordinator were **Tom Stebbins**, appointed in 1990, and **Mary McLellan**, appointed in 1992. In 1994 an Advisory Committee, consisting of county extension agents, was established to provide advice on statewide needs, policy, and objectives. The program is currently funded by fees paid by the volunteers, who agree to provide advisory services to homeowners for a fixed period of time. (See extension section.)

Loescher Becomes Chair. Jack Kelly resigned as chair in 1990 after 13 years of major changes in staff and facilities, and **Wayne Loescher** became chair. Loescher had obtained his Ph.D. in Botany and Biochemistry from Iowa State, and had been a member of the Horticulture Faculty at Washington State University, Pullman for 15 years. There his research involved partitioning of photosynthates in cherry and celery, nitrogen uptake in potatoes, and watercore in apples. He was able to continue his research at MSU with the assistance of post-doctoral fellows, emphasizing the metabolism of carbohydrates in celery, apple and cherry, as well as the gene sequences for their synthesis and transport.


Wayne Loescher

Loescher arrived at a time when funds were limited, faculty positions were being lost, and student numbers were declining. Over the next few years spending was reduced by cutting clerical staff and reducing financial support for technical assistance. By 1997, some faculty positions had been restored and others reallocated among specializations. Industry funding of research increased substantially, especially in floriculture, where greenhouse growers contributed voluntarily through the "2 cent fund" – 2 cents for every square foot of greenhouse space.

Although the University as a whole downsized, the base budget for Horticulture doubled from $3 million to $6 million during Loescher's tenure, and extramural funding increased from $3 million to $9 million. The number of graduate students remained stable, but faculty numbers increased about 10% and the number of post-doctoral fellows also increased appreciably.

Recruiting of Students. Undergraduate enrollment began to decline in the mid-1980s, reaching a low point in 1991. **Barbara Fails**, who had moved from Auburn University to MSU in 1985, with the support of the Admissions Office, began a program of recruiting undergraduates. Every applicant who had taken the Scholastic Aptitude Test in the United States and had checked areas of interest relating to horticulture was contacted and invited to apply both for admission and for a new freshman scholarship (the Horticulture Industry Scholarship). The students were required to come to E. Lansing to interview for the scholarship, and thus were exposed to the campus, the new building and the gardens. As a result, enrollment increased in the late 1990s until at one point the Department had more students than any other horticulture department in the United States. Fails's success was noted by the College, and she was appointed Assistant Director of Outreach to assist in the design and marketing of both credit and non-credit educational programs for off-campus students and industry professionals.


Barbara Fails

Among the new students were older adults, primarily women, who had returned to college to pursue new careers, or to continue studies that had been interrupted. One woman in her 70s came back so that she could join the Peace Corps. **Patricia (Erwin) Zandstra** organized a group for older women so that they could interact with others of their own age and experience.

Changes in curricula and shift from quarters to semesters. In 1987 the University Committee to Review Undergraduate Education (CRUE) was established to evaluate curricula across the entire University. This, in turn, led to conversion from the quarter to the semester system, increased requirements for "core" courses, with less emphasis in horticulture on commodities, and the addition of a capstone course in each major. In the Department internship became a requirement, rather than an option.

Beginning in the fall of 1992 the University changed, over a three-year transition period, from 10-week quarters to 15-week semesters. The new curriculum necessitated consolidation and/or elimination of one-third of all courses, and changes in requirements for academic degrees based upon the CRUE report. Also involved was a change to computerized registration and student record systems. **Robert Herner** took responsibility for curriculum changes for the Department during the transition. Although these changes eventually improved the curriculum and made registration and record keeping more efficient, they made life during these 3 years stressful for both students and teaching faculty.

The Plant Initiative (Project GREEEN). In the late 1980s and early 90s money was insufficient to fund problem-solving research with plants. The College therefore began to work on the Plant Initiative. This program paralleled the previously funded Animal Initiative, which supported hiring new faculty and building new facilities in Animal Science. The problem in the plant sciences was not out-of-date facilities or lack of faculty, but lack of operating funds and support personnel. A meeting was held in March of 1994 to identify the needs, and a committee was formed, chaired by **Dean Fred Poston**, to prepare a proposal for review by various commodity groups, who would then take this to the Legislature. In the final draft, a total of $4.5 million was set as a target annual appropriation, not more than 20% of which was to be used for faculty salaries, consistent with the early decision that the primary deficiency was operating dollars, not faculty.

Project GREEEN (Generating Research and Extension to Meet Economic and Environmental Needs) was a cooperative effort between plant-based commodities and businesses, together with Michigan State University Extension, the Michigan Agricultural Experiment Station and the Michigan Department of Agriculture, to advance Michigan's economy through its plant-based agriculture. Its mission was to develop research and educational programs, ensure and improve food safety, and protect and preserve environmental quality. The program was patterned after the Integrated Pest Management Project, funded some 15-20 years earlier.

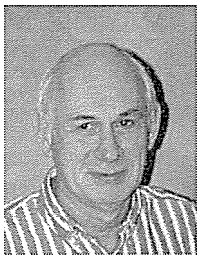
The main goals were to: (1) reduce producers' dependence on harmful chemicals (using alternative chemicals or methods); and (2) add value to crops, e.g., wine from grapes and concentrated juice from cherries. Fruits, vegetables, ornamental crops and agronomic crops were included. Ten per cent was set aside in a contingency fund for rapid response to unforeseen problems, such as plum pox, the rose chafer, and the European chafer. Much of the money was to be used for extension-related projects, with extensive use of post-doctoral fellows.

A Center for Integrated Plant Systems was created, with plant diagnostics and Integrated Pest Management (IPM) as components. As proposed, Project GREEEN would provide $8.6 million annually for an automated weather information system, and 37 positions in vegetables, fruit, floriculture, woody ornamentals, turf and field crops. Of this amount, $1.8 million would be provided by commodity groups and processor organizations.

Dean Poston, **Ian Gray**, Associate Dean and Director of the Experiment Station, and the Michigan Farm Bureau, with the assistance of several major commodity groups, including **Phil Korson** of the Cherry Marketing Institute, and **Bud Kudlow**, representing the potato industry, convinced the Legislature to approve the project, which provided $500,000 on a recurring basis in 1996. This increased to $1 million in 1997, and finally to a $6.5 million appropriation. The program was administered by the Directors of Research and of Extension through the Directors' Action Team, of which Horticulture's **James Flore** served as temporary chair, with the responsibility for coordination and implementation. Subsequently **Gary Lemme**, Associate Director of the Agricultural Experiment Station, was appointed Director. Some of the funds were used to pay the salary of a coordinator for extension/communication. All researchers had to submit reports or they would lose their appropriations.

The services undertaken include: a) creation of laboratories for Michigan residents for diagnosis of weed, plant disease, insect and nematode problems; b) initiation of an integrated crop management (ICM) program to study how best to control crops and pests using methods that are both economical and environmentally sound; c) formation of a Plant Coalition to cooperate with industry in anticipating needs and crises in the production of fruits, vegetables, and field crops; and d) establishing a State-wide network of automated weather stations. In addition, individual projects are funded.

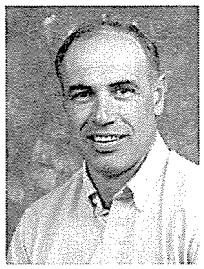
The Plant Transformation Center. The Directors of Project GREEEN requested that **Kenneth Sink** prepare a proposal on transformation and regeneration of selected species. The research would focus on specialty crops of significant importance to Michigan agriculture that were not being researched by other universities or the private sector. In December 2001 the Michigan Agricultural Experiment Station approved the establishment of a Plant Transformation Center under Sink's direction; in January of 2002 a 3-year implementation program began to bring the center on stream, with a grower committee to provide guidance on industry needs.


Kenneth Sink

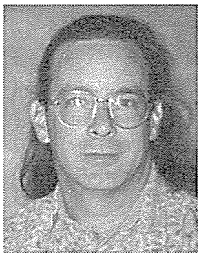
Three species – celery, sour cherry, and blueberry – were chosen for the work. Considerable progress has been made in using tissue culture to develop regeneration systems, and model gene transfers have been accomplished. Future work will be devoted to insertion and evaluation of genes of agricultural interest. Eventually the Center will broaden and continue the work already in progress on both horticultural and other crops, and provide support to scientists working in this area.

Ethical Issues in Biotechnology. Given public concern regarding molecular biology and genetically modified organisms (GMOs), **Rebecca Grumet** and **Fred Gifford**, a colleague in the Philosophy Department, developed a course entitled "Biotechnology in Agriculture: Applications and Ethical Issues." This covers the scientific basis for, and application of, molecular genetic tools in agriculture, as well as their potential benefits and risks, including health, and environmental, social and ethical concerns.

Perry Succeeds Loescher as Chair. After 10 years as chair of the Department, **Wayne Loescher** resigned in 2000 to devote full time to teaching and research. **Ronald Perry** was appointed interim chair, then named chair in 2002 following a search process involving several candidates from other institutions. He had obtained his Ph.D. at Texas A & M, and came to MSU to continue **Robert Carlson's** rootstock work on Carlson's retirement in 1980. Perry expanded the program to include evaluation of rootstock/cultivar combinations, root systems and soil health, and training systems, as well as a comparison of methods of pest management, from standard pesticide applications to "pure" organic methods (see Research section). He became chair at a critical juncture in the Department's history, given the recession, which reduced funding from the Legislature.


Ronald Perry

Organic Farming. John Biernbaum's (Ph.D. '85) main responsibilities were in floriculture until he became interested in organic farming in the mid-1990s. He had started farming organically on about 10 acres of his own property, and attended a conference sponsored by the Upper Midwest Organic Farming Organization. Over 1000 people were there, and he met many who had had no formal instruction in agriculture, but were trying to learn how to farm. Some of the speakers were well-informed, but some were not, and John decided that he could make a contribution by using his greenhouse experience to help small farmers meet organic certification. He began working on organic production of vegetable transplants and preparing composts, and was aided by **Richard Harwood** and **Susan Smalley** in Crop and Soil Sciences, both of whom had experience in organic farming. Subsequently Biernbaum became a featured speaker at conferences on this topic.


John Biernbaum

Biernbaum was concerned that horticulture students, despite an interest in organic farming, were not being exposed to the concepts involved After talking with students about establishing an organic farm on campus, he obtained permission to change the focus of his research, and offered a 1-credit selected topics course indicating "what organic farming is and what it isn't." He also raised the possibility of starting a community-supported farm, with memberships sold to individuals who get fresh local food every week during the growing season; similar student farms existed in several states. The idea became a reality when the Kellogg Foundation provided a grant of $95,000 to Biernbaum and several cooperating faculty in other departments, and work began on 6 acres at the Horticulture Teaching and Research Center south of campus. Several plastic greenhouses were constructed, and work on composting began.

The project is expected to be self-supporting within 4 years through membership fees and income from sale of crops to non-members. It will be a 48-week Community Supported Agriculture (CSA) farm, with a program consisting of three 16-week sessions to coincide with semesters. The organizers expect to have produce for the customers every week, with the exception of mid-December to mid-January.

Sign for Student Organic Farm at E. Lansing.

Virtual University. Some University courses are offered on the internet or taught off-campus, permitting students to "learn where they earn" without having to come to the main campus. Several horticulture courses, including Landscape Design, Pruning and Training, Landscape Plants I and II, and Landscape Maintenance, are available in Grand Rapids and/or Traverse City during the school year.

New Modular Course Offerings. One-credit "modular" courses, all electives, were first offered in 2005. These deal with specific aspects of a subject, rather than with the traditional range of topics, making the courses more attractive to non-majors, 2-year students, lifelong education students, and potential students involved in the Horticulture Gardening Institute, Master Gardeners, and Virtual University. Other advantages are that they provide more opportunity for (1) offering advanced courses and courses on specific topics, such as pruning, and in areas with few majors, such as pomology, and (2) facilitating interaction between research faculty serving as guest lecturers and both non-majors and beginning horticulture students.

Currently, the following courses are available: Poinsettia Production, Ornamental Grasses, Ornamental Plant Management, Landscape Restoration and Native Plants, Landscape Maintenance Operations, Sustainable Landscape Practices, Apple and Pear Production, Berry Production, Pruning, and Agribusiness Service Marketing. Some of these have prerequisites, others do not.

Summary

Horticulture has been a fixture in the teaching program at MAC/MSC/MSU ever since the institution opened its doors in 1857. Horticulture graduates have played an important part in improving agriculture, not only in Michigan, but throughout the United States and abroad. As science – and agriculture – have increased in complexity, the Department's course offerings and facilities have kept pace, so that today's graduate is able to compete in a rapidly changing world.

The following chapters deal with what research and extension in horticulture have done for the farmer, as well as other citizens, not only in terms of crop production, but of quality of life as well.

CHAPTER 2

SEARCHING FOR ANSWERS - RESEARCH I

Some aspects of research have already been covered, including **Beal**'s experiments with corn and apple. Chapters 2 and 3 are more detailed reviews of the research conducted by Horticulture faculty in a number of areas.

BREEDING AND SELECTION

Cultivar Testing. Comparing cultivars of vegetables and fruits occupied much of the time of Department personnel in the late 19th and early 20th Centuries. In 1878 Beal reported that the College had 36 cultivars of grapes in addition to 41 of "Haskell's new seedlings," and that over 36 cultivars of raspberries and blackberries had been planted. Fruit testing was occurring at locations other than E. Lansing and South Haven in 1891, when "fifty places in the state" had smaller collections. A planting at Grayling in Crawford County contained 50 cultivars of Russian apples "especially selected for their hardiness" to determine if they could survive the harsh winters. In 1898 cucurbit seeds were obtained from Siberia to evaluate the cold hardiness of the plants. Although they were "somewhat hardier" than local cultivars, the fruit were generally "small and of poor, and even of a disagreeable, flavor." In 1900 tests of vegetable and small and tree fruit cultivars were begun at the Chatham sub-station in the Upper Peninsula.

A. TREE FRUITS

Systematic Pomology. During the period from 1850 to the 1920s growers were greatly interested in cultivars of all fruits, and were looking for seedlings with promise. Among the major attractions at annual meetings of the American Pomological Society (APS) and local horticultural societies were displays of fruit supplied by individuals, experiment stations and nurseries. For example, more than 6000 plates of fruits, chiefly apples, were displayed at the 14th session of the APS in Boston in 1873. In 1895, MAC boasted 750 cultivars of fruit – 350 of apple, 100 each of pear, grape, and peach, and 50 each of plum and cherry (Rept. Mich. State Hort. Soc. for 1895, p. 11).

Fruit growers considered graduates who were not able to identify cultivars to be "poorly educated." For this reason, horticulture departments placed great emphasis on the teaching of "systematic pomology" – the identification of cultivars. Courses in systematic

Michigan Pomological Society's fruit exhibit at the Pan-American Exposition in Chicago in 1900.

olericulture and ornamentals were also included in the curriculum during this period. One of the standard texts was **Brooks Drain**'s (Ph.D. '33) *Essentials of Systematic Pomology* (1925). The author used a system described in Bul. 275 of the New York State Agricultural Experiment Station, which classified two hundred and seventy-eight cultivars in thirty-six groups. Similar keys were available for other tree and small fruits. At MAC/MSC, systematic pomology was taught until 1960.

Wax Apple Collection. Sarah M. Irish married **Stanley Potter** in 1866, and the couple lived in Farina, Ill., where he died in 1892. Sarah had learned how to make wax fruits in her childhood, and now began a new career in this field. Reflecting the interest in cultivars, the Illinois Board of Agriculture commissioned her to make 200 samples of fruits and vegetables for the World's Columbian Exposition in Chicago in 1893, and Michigan Agricultural College ordered another 400 specimens for its 70 ft². display, along with "real" fruits. Molds of actual fruits were made and the specimens cast in these; for this work she won a medal for her skill as an artist. On May 1, 1901, four cases of wax models of fruit were shipped from the College to Buffalo for an exhibit there. They were eventually returned as classroom equipment. These continued to be mentioned in Departmental documents until 1915, but no record is known of their subsequent fate. Irish later prepared similar specimens for colleges in Illinois, Ontario, and

Storrs, Conn. She spent 8 years at Guelph, Ontario, making fruits and vegetables for the Ontario Agricultural College, which still has them in its collection.

Native vs. "Foreign" Cultivars. Many pomologists believed that "local cultivars" arising from seeds were superior to "imported" ones. **Marshall Wilder**, who served as president of the American Pomological Society for over 30 years, stated in 1875 that, given the poor survival of trees imported from abroad, new cultivars should be produced from seed.

Stevenson Fletcher, Head of the MAC Horticulture Department, published a bulletin in 1910 listing the cultivars of several species of fruits that had originated in Michigan. Apples (43), peaches (67) and strawberry (25) topped the list. He stated that, "As fruit growing becomes more and more specialized, greater prominence will be given to local varieties, since these are apt to be perfectly adapted to the conditions where they are grown..." Of the 185 cultivars listed, only 15 had resulted from controlled crosses. Echoing Wilder's comments, he concluded that, "We should have more seedling fruit trees growing in Michigan." As will be seen, this attitude changed as competition increased.

Reports by subsequent directors indicated continued interest in cultivar trials and breeding. Fifty new cultivars of peach were obtained for the South Haven collection from the Geneva (N.Y.) Experiment Station in 1915, and 21 apple crosses were made. In 1914 a 'Baldwin' apple bud selection program was started to determine which lines produced the greatest yield and the largest fruit. Shortly before 1920 the South Haven Station signed an agreement with the USDA for breeding blight-resistant pears and hardier peaches, in addition to apples. By 1920, then Superintendent **H. F. Wight** reported that the Station had "one of the largest collections of peach varieties" for breeding work, that he had made many crosses, and that more space was needed for seedlings.

L. H. Bailey, in his *Annals of North America for the Year 1892*, listed 878 cultivars of apple available from commercial nurseries. This infatuation with cultivars later waned, given the problems involved in marketing them.

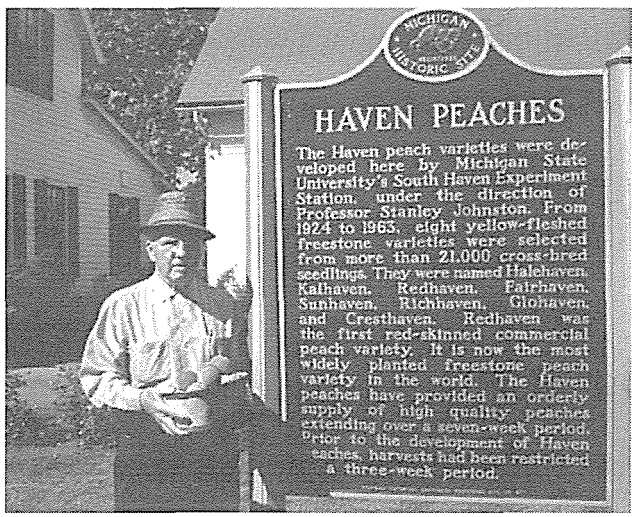
In the mid-1920s, **V. R. Gardner** conducted a survey of 100 commercial Michigan apple orchards, and reported a total of 139 cultivars being grown. However, only 13 of these were represented by more than 1000 trees, and only three (Jonathan, Wagener, and Duchess of Oldenburg) were found with more than 1000 trees less than 10 years old.

Despite all the efforts made in tree fruit breeding in Michigan, very few cultivars of fruits other than peach were ever named, although one red sport of 'N. Spy' was released for trial in 1924. In 1927 the Greening Nursery of Monroe, Mich. was given buds for propagation of "bud varieties," but there is no indication of what these were.

"Mr. Haven" – Stanley Johnston's Legacy. Soon after completing his bachelor's degree in Horticulture at MAC, Stanley Johnston was appointed superintendent of the South Haven Station. One of Johnston's first contributions in his new position was a thorough review of peach production in Michigan, and the factors that limited profitability. In 1924, 'Elberta,' a late-ripening, yellow cultivar, accounted for about 85% of Michigan peach production. Heavy reliance on this one cultivar, and several others that ripened within a week of 'Elberta,' resulted in glutted markets and low prices. Johnston therefore began a breeding program, and soon obtained several promising selections of early-ripening peaches.

Between 1932 and 1963, eight yellow-fleshed freestone peach cultivars – Halehaven, Kalhaven, Redhaven, Fairhaven, Sunhaven, Richhaven, Glohaven, and Cresthaven – were selected from more than 20,000 progeny of crosses made by Johnston. His colleague, **James Moulton**, assisted in developing the last two selections. These cultivars ripened from 1 to 4 weeks before 'Elberta,' and extended the harvest season from the original 3 weeks to 7. This permitted more orderly marketing and a longer season for the consumer. 'Redhaven' was the progeny of a cross between the first two cultivars released ('Halehaven' X 'Kalhaven'), and was the first commercial red-skinned cultivar. It brought from $1 to $3 more per bushel then did 'Elberta,' and became the most widely-planted freestone cultivar in the world.

The 'Haven' peaches as a whole accounted for 20% or more of the U.S. crop of freestones in the late 1960s. Two of the selections made by Johnston – 'Jayhaven' and 'Sweethaven' – were named by Johnston's successor,



Johnston and historical marker commemorating his work in breeding peaches.

Robert L. Andersen (M.S., MSU, '64; Ph.D., Univ. Minnesota '68), in 1976, and a third, 'Newhaven,' in 1978. In addition, two clingstone cultivars for processing – Suncling and Spartancling – were released in 1961 and 1978, respectively. The impact of **Johnston's** work cannot be measured by production of his releases alone, for several of these, especially 'Halehaven' and 'Redhaven,' were used as parents by other breeders, and were also the source of commercially important mutations (bud sports), such as 'Garnet Beauty.' Some 80 such cultivars now exist.


Robert L. Andersen

In addition to work with peaches, Johnston conducted a competition to find superior seedling apricots for mid-Western conditions. As a result he introduced the 'Curtis' apricot, named for the owner of the farm on which it was found. It was more cold-hardy than the cultivars then available, and therefore better suited to Michigan's cold climate; it was considered to be the first commercially acceptable cultivar east of the Rocky Mountains. Some 'Curtis' trees still exist in West Central Michigan and in the Traverse City area. Johnston also bred and released 'Goldcot,' which remains available from nurseries. Andersen and **Moulton** later (1978) released 'Traverse,' which had been selected by Johnston.


Mr. Curtis and Mrs. Stanley Johnston with 'Curtis' apricots.

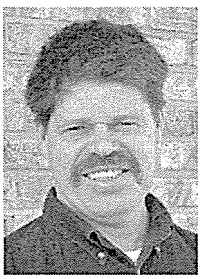
Selections of Sour Cherry. In addition to his duties as Department Chair and, later, as both Chair and Director of the Agricultural Experiment Station, **V. R. Gardner** was active in research. He took a particular interest in strains of sour cherry. He and **Walter Toenjes**, superintendent of the Graham Experiment Station at Grand Rapids, propagated over 100 distinct strains of 'Montmorency' cherry and followed their growth and productivity over a period of up to 16 years. The strains differed in various characteristics, such as fruit size and shape, date of maturation, and yield, and many of them were unstable. Several papers were published, but the strains appear to have been lost sometime thereafter.

Robert Carlson conducted a similar study, but with fewer strains, in the 1960s-70s. The only strain that yielded as well as or better than 'Montmorency' was 'Shook Montmorency' (MAC clone no. 15), named for the farm where it was found. This later was identified as an old Polish cultivar. None of these strains/cultivars was accepted commercially.

Subsequent Work With Stone Fruit. To provide a smooth transition, Andersen worked with Johnston in his breeding program at South Haven until Johnston's death in 1969. Andersen continued the peach breeding work that Johnston had begun, released several peach cultivars from crosses made by Johnston (see above), and started a sour cherry breeding program before moving to Clemson University as Chair of the Horticulture Department in 1981.

Andersen's successor was **Amy Iezzoni**, who earned a Ph.D. at Wisconsin with **Clinton Peterson**, formerly a cucumber breeder at MSU (see below). She continued the peach breeding program for several years, but this has since been taken over by **William Shane** (Ph.D. in Plant Pathology, University of Minnesota). In 1992, Shane joined the staff at the Southwest Michigan Research and Extension Center (see Chapter 4). He is focusing on developing hardy and disease-resistant peach cultivars bearing red-skinned, yellow- or white-fleshed fruit that are large, firm, and sweet. In 2003 Shane and Iezzoni released the yellow- and melting-fleshed cultivar Beaumont.


Amy Iezzoni


Bill Shane

Iezzoni greatly expanded the work begun by Andersen on sour cherry. At the time, U. S. growers relied entirely on 'Montmorency,' a 400-year-old cultivar, resulting in a monoculture and making the industry vulnerable to crop losses from pests or unfavorable weather. Other cultivars available were closely related genetically. In addition, 'Montmorency' has yellow juice, and processors must add red dye to pie filling and other products. To broaden the genetic base, Iezzoni traveled to eastern Europe to visit cherry breeders in Yugoslavia, Bulgaria, Romania, Hungary, Poland, Russia and the Ukraine, where sour cherry

is a native species and much more genetic diversity exists. Breeders there had made major advances in improving germplasm, and **Iezzoni** was able to bring back pollen to use in making crosses. (Scion wood could not be imported without passing through USDA plant quarantine at Beltsville, Md., which could take several years.)

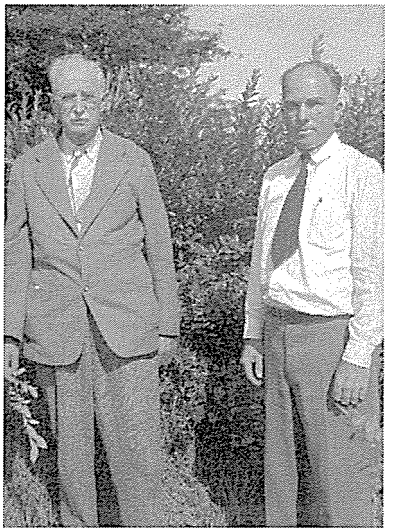
During the course of several additional visits, arrangements were made for breeders in eastern Europe to supply seeds from controlled crosses; these were germinated and planted at the Clarksville Experiment Station so that selections could be made. More than 10,000 seedlings, including both sweet and sour cherry, as well as several other species, were obtained in this way. These were evaluated for fruit quality and resistance to diseases and freeze injury, as well as potential use as size-controlling rootstocks, and superior clones were selected, some of which have been added to the collection maintained by the USDA-ARS Plant Genetic Resources Unit at Geneva, N.Y.

In addition, scions of one Hungarian sour cherry cultivar – Ujfehertoi Furtos – were sent to Beltsville for decontamination and subsequently propagated for more extensive trials in Michigan. This cultivar was chosen because it is tolerant to diseases, is adapted to Michigan's climate, has dark red juice suitable for pie making, and, unlike 'Montmorency,' can be eaten fresh as well as processed. Given the difficulty of pronouncing the Hungarian name, it was rechristened 'Balaton' for a Hungarian lake. Many commercial plantings are now bearing fruit. Although the cultivar has many good qualities, results to date suggest that it yields less than 'Montmorency' and is more susceptible to freeze injury. Two additional cultivars, Erdi Botermo and Erdi Jubileum, rechristened Danube and Jubileum, have potential for home gardeners.

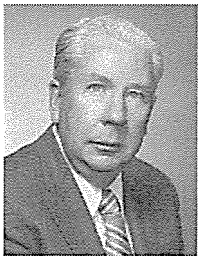
Cherry Genetics. Iezzoni and her students are studying the genetic control of tree and fruit traits in sweet and sour cherry. Early results with sweet cherry suggest that fruit size is a function of cell number, rather than cell size. Many characteristics, such as time of bloom, are quantitative (controlled by many interacting genes), rather than qualitative (controlled by one or a few genes). Iezzoni's group is using the technique of quantitative trait loci (QTL) to identify the regions of the sour cherry genome that control time of bloom. This technique permits the statistical analysis of such traits, facilitating the selection of individual plants for breeding purposes and providing information that may permit cloning of the genes involved.

B. Small fruits

Stanley Johnston's major contribution, aside from peach breeding, was in serving as a catalyst in developing the blueberry industry in Michigan. Prior to his work, most blueberries were harvested from the wild. After seeing Johnston's trial planting of USDA selections at the Experiment Station, **James E. Keefe**, a Chicago dentist who vacationed in South Haven, established a partnership with Johnston, and provided the money to buy a farm near Grand Junction with acid soil – just the type of soil that we now know is ideal for blueberries. Johnston furnished the expertise and the two began growing the crop in 1928. (Blueberries are still being grown on the farm that they purchased.) This was the beginning of what is now an $80 million to $100 million industry in Michigan – the leading state in production of cultivated blueberries.


Dr. James Keefe and S. Johnston.

Johnston also made crosses between the cold-resistant low-bush blueberry from the northern part of Michigan and the more cold-tender highbush blueberry native to Southern Michigan. After 25 years of often unrewarding work, Johnston and **James Moulton** (Ph.D., University of Chicago, 1941) introduced 'Bluehaven,' and 'Northland' – two commercially important, medium-high varieties in 1967. 'Northland' can be grown in areas too cold for most highbush cultivars, and is popular among U-Pick growers in the U.S. and Canada. Two additional selections made by Johnston were named after his death. 'Tophat' was released by Moulton and **Andersen** in 1977 for use in the home garden, and another commercial cultivar, Bluejay, in 1978.

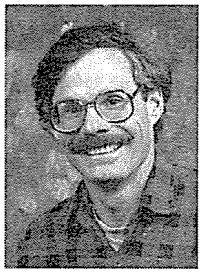

James Moulton

Even more important than his breeding work with blueberries were the experiments that Johnston conducted on cultivar evaluation, fertilizers, soil types, and methods of propagation and cultivation, for these provided a solid foundation for the Michigan industry and thereby made

possible the profitable cultivation of large areas of poor, sandy soils.

Johnston was instrumental in organizing the Michigan Blueberry Growers Association, which markets the fruit, provides supplies and services, and conducts research to provide members with up-to-date information on the best methods of production. More than half of Michigan's blueberry growers are now members of this organization.

James Hancock, who earned a Ph.D. with **Royce Bringhurst** at the University of California in Davis, became a faculty member at MSU in 1979. He and his students have developed a molecular map of an interspecific hybrid of the highbush blueberry (*Vaccinium corymbosum* L.) and the wild species (*V. darrowi*) to provide a basis for elucidating patterns of inheritance and to facilitate transfer of useful traits from *V. darrowi* to *V. corymbosum*.



James Hancock

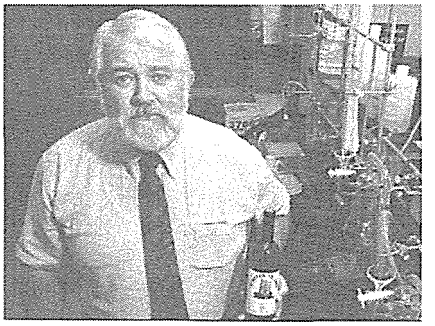
Strawberries. Moulton worked with Johnston in breeding strawberries suitable for Michigan, most of the research being done at South Haven, but only one cultivar (Scarlet) was released. Because photoperiod is a controlling factor in both flower and runner production in strawberry, Hancock's group is using molecular markers to map genes involved in these responses.

Johnston and Moulton in strawberry plot

To expand the germplasm base of the cultivated strawberry, Hancock, together with colleagues in Minnesota and in Ontario, Canada, has evaluated several thousand native clones of *Fragaria*. The team has crossed the most promising of these with representative cultivars from the major breeding programs in North America, and is now using this material in developing new cultivars.

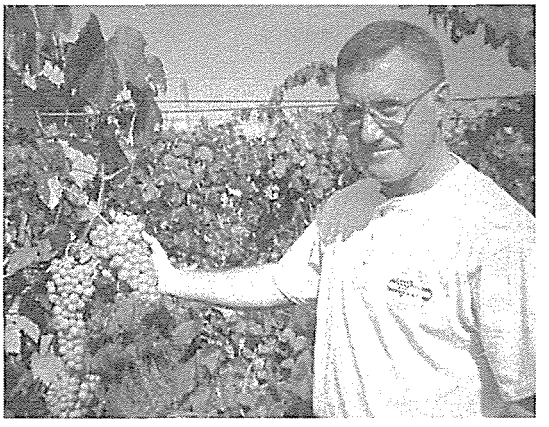
Grape Cultivar Evaluation. Evaluation of grape cultivars, either those never grown commercially in Michigan or advanced selections – primarily from the New York State Agricultural Experiment Station at Geneva – has led to major expansion in the range of cultivars grown commercially in Michigan. Prior to 1970 Michigan's industry was almost exclusively based on three cultivars of American grapes (*Vitis labrusca*) – Concord, grown for both juice and wine production, and Niagara and Deleware, grown for wine.

G. Stanley (Stan) Howell began working with grapes in 1970 and has since evaluated many cultivars of European grape (*V. vinifera*) and American X European hybrids for cold hardiness, resistance to insects and diseases, and response to vine training systems. These efforts have resulted in major changes in the cultivars used for Michigan wines. Those used in 1975 produced less than 5% of the wines produced in 2000. *V. vinifera* cultivars, such as Cabernet Franc, Chardonnay, Gewurztraminer, Pinot Gris, and Riesling, and hybrids, including Chardonel, Chambourcin, Seyval, Traminett and Vidal blanc, are the primary ones being used for wine production today.



G. Stanley (Stan) Howell

Tom Zabadal came to Michigan from Cornell in 1989 as Director of the South West Michigan Research and Extension Center at Benton Harbor. He is evaluating table grape cultivars for use in Michigan.



Tom Zabadal

C. Vegetables

Vegetable breeding was a negligible part of the Department's program in the early years. Prof. **Prentiss** introduced a new tomato cultivar ("College Seedling") in 1865, and a new "Peach Blow" potato was "highly acclaimed" in 1866. Many trials were being made of cultivars, however, and these could well have been introduced elsewhere. **Beal** conducted several noteworthy experiments with corn (see above), but he was a generalist, rather than a dedicated plant breeder. Only much later did individual faculty members concentrate on breeding.

Breeding of vegetables became a major concern at MSU only in the mid-20th century, following the lead of breeders of field crops, such as corn. **Clinton E. ("Pete") Peterson** (Ph.D., Iowa State, 1947) was a potato and onion breeder with the USDA at Iowa State before coming to MSU. Here he began breeding research on carrots and cucumbers, as well as onions. His major contributions included a new method for producing F_1 hybrid cucumbers by genetically controlling sex expression. All-female parent plants could now be crossed with standard male/female (monoecious) parents to produce hybrid seeds in an open-field environment. In 1960 he released the first ('Spartan Dawn') of a number of "Spartan" line hybrid cucumbers using his new method of hybrid seed production. The genetic material and techniques have been adopted by cucumber breeders worldwide. Today, essentially all cucumber cultivars are F_1 hybrids. The use of gynoecious hybrids allowed mechanical once-over harvest of pickling cucumbers (see section on mechanical harvesting). This new technique offset a critical labor shortage that threatened the existence of the Michigan pickle industry

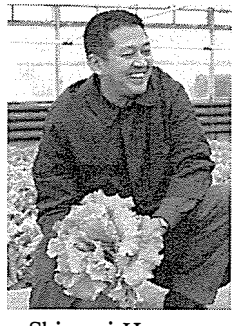

Clinton Peterson

Peterson also developed many parent lines of onions that were released to seed companies for use in private breeding programs. These lines were not protected as MSU intellectual property, but were freely distributed to all U.S. seed companies upon request as public releases form the Agricultural Experiment Station. The pedigrees of the hybrids produced by private companies are proprietary trade secrets, thus there is no way to evaluate Peterson's impact in this area. However, private breeders affirm that many of Peterson's parent lines are still used today. In 1968 Peterson accepted a position as Director of the USDA onion breeding program at the University of Wisconsin in Madison. While there he introduced 'Spartan Banner 80,' 'Sweet Sandwich' and several other cultivars, and continued to work on onions. In his final years of research he focused on the development of germplasm with potentially valuable new traits that could be used by private breeders. He developed the rudiments of all of these while at MSU.

Peterson's work on cucumbers and carrots was continued by **Larry Baker** (Ph.D., Univ. of Wisconsin, 1968). Together with Peterson, he released some nine gynoecious/pF hybrid pickling cultivars, emphasizing multiple flowers per node, multiple disease resistance, and improvements in processing quality. His basic research was on the development of parthenocarpic (seedless) gynoecious cucumber hybrids. Baker's program with F_1 hybrid carrots developed a method for hybrid seed production using cytoplasmic-genetic male sterility in 3-way hybrids. Almost all carrot cultivars grown world-wide today are 3-way hybrids produced by this method, resulting in major improvements in color, flavor, yield and cello-packout. He released and named about 20 'Spartan' hybrid cultivars and their parent lines between 1969 and 1981. These improved hybrids were selected and developed especially for Michigan muck soils so that they could compete favorably in the market with California carrots. The two hybrids 'Spartan Fancy' and 'Spartan Delite' made up most of the Michigan cello carrot production. In the 1970s, 'Spartan Bonus' accounted for most of the processing acreage, especially the carrots used by Gerber Products for baby food. The genetic improvements in carrot flavor were a major factor in the development of "baby carrots," introduced by Bolthouse Farms, a Michigan-based company that relocated to California to become one of two major companies that produce and market nearly all U.S. fresh carrots. In 1980 Baker joined the Asgrow Seed Co., becoming Director, Worldwide Vegetable Research. He retired in 2000.


Larry Baker

Shigemi Honma (Ph.D., Univ. of Minnesota, 1953) worked with rutabaga, cauliflower, broccoli, celery, and lettuce, but also bred tomatoes, peppers, and snapbeans. He introduced several cultivars of cauliflower designed to reduce the labor of tying leaves over the head for blanching; these included


Shigemi Honma

'Stovepipe' and 'Self-tying' (leaves covering the curd) cultivars, as well as a green-headed type.

Deran Markarian, a forage crops breeder at Washington State University, came to MSU in 1960. Here he worked with **Peterson** and plant pathologists **Donald DeZeuw** and **John Lockwood** on developing disease resistance in vegetables. However, his major research involved developing cultivars of cold-hardy peas for the Upper Peninsula, and of lettuce suitable for muck soils. In 1968 he released 'Spartan Lakes' lettuce, a selection from 'Great Lakes' lines with heading qualities superior to those of California cultivars. In addition, he introduced several lettuce cultivars (Oswego, Fulton, Minetto) released by **George Raleigh** of Cornell that were well adapted to Michigan conditions, and tested artichoke and okra lines for possible use in the State. Aside from his breeding work, Markarian was described by his contemporaries as a "mechanical genius who could fix anything" from sports cars to greenhouses. In 1967 he left MSU to join the Curtis-Burns processing company in Rochester, N.Y.


Deran Markarian

On joining the faculty at MSU **Lowell C. Ewart** continued the onion breeding program begun by **Peterson**. The Michigan Onion Growers Research Committee needed a better and larger onion for the Michigan market, and Ewart's primary goal was to develop larger, storable and sweeter onions. He released 'Spartan Supreme' to the Michigan Seed Foundation for seed production, but the Foundation was more interested in field crops – corn, wheat and soybeans – and turned the project back to MSU. Currently no seed of this cultivar is being produced commercially, so its future is uncertain. Germplasm developed from the program was released to seed companies.

In 1982 **Kenneth Sink** initiated an asparagus breeding program. The Michigan Asparagus Research Committee was instrumentaal in obtaining USDA grants to support research on both cultural practices and breeding to increase resistance to *Fusarium* species that cause crown and root rot. Additional financial support was provided by MSU and Michigan asparagus growers, and **Christine Stevens** and **Wade Elmer** in Botany/Plant Pathology, and Sink and **Hugh Price** (Ph.D. '69) in Horticulture, worked cooperatively on the project. Only slight tolerance was found in the lucullus cultivars, and crosses to the resistant fern asparagus (*Asparagus densiflorus springerii*) yielded no seed. The major finding was that cultural practices, including cover crops, reduced the incidence of the disease.

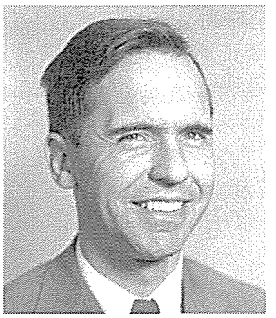

Hugh Price


Bernard Zandstra

In the last three decades of the 20th Century Hugh Price and **Bernard Zandstra**, who came to Michigan from the University of Hawaii in 1977, evaluated many vegetable cultivars and made recommendations to growers. Zandstra and **Robert Herner** have also evaluated cultivars of rhubarb in plots at both E. Lansing and Clarksville.

D. Floriculture

Judd Haney came to MSU in 1949 after working as a plant breeder for the George J. Ball Co. Here he worked primarily with snapdragons and begonias, and released three snapdragon cultivars – Spartan Bronze, Spartan Rose, and Spartan White – in 1952. (Haney died unexpectedly in 1963.) One of his Ph.D. students, **Clark Paris** (Ph.D. '56), who later became a librarian on campus, did ground-breaking work on the inheritance of flower color in petunia. He classified plants used as parents into 11 classes by flower color, then crossed each parent with all others. By examining the F_1s, he was able to identify six genes that acted independently in controlling this characteristic, and their commonality across species.


Judd Haney

On joining the Department in 1963, Kenneth Sink conducted inheritance studies of flower characteristics, and of cytology and polyploidy in several species, including poinsettia. Subsequently he turned his attention to micropropagation of apple and maple, and isolation and fusion of protoplasts to produce symmetric and asymmetric somatic hybrids. Experiments were conducted with tomato, eggplant, asparagus, ornamental *Nicotiana*, and mint.

In 1980 Lowell Ewart began a breeding program with several flower crops and produced several inbreds for use by commercial seed companies. Some of their characteristics were narrow leaf shape, to reduce infection by mildew and leaf blight, greater branching (zinnia), and sterility (petunia), to reduce the need for costly hand-pollination. In addition he released one hybrid cultivar each of begonia (Spartan Beauty), petunia (Mary Mitchell), and zinnia (Spartan Rainbow).

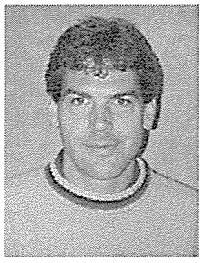
New Approaches to Plant Improvement

Molecular biology. Within the last 20 years, molecular biology has become an important aspect of biological research, including work in horticulture. In 1988 **Kenneth Sink** and Israeli post-docs were among the first to transform eggplant using *Agrobacterium*. Similar transformations were then successful with other crops, including asparagus, petunia and mint. Somatic hybridization was successfully used to produce interspecific hybrids of mint with the aim of increasing resistance to *Verticillium*. However, the oil profiles of the hybrids were unacceptable commercially. The early work with *Agrobacterium* provided the background for establishing the MSU Plant Transformation Center in 2001 (see above).

Rebecca Grumet (M.S. '80, Ph.D. '85) joined the faculty in 1987. She has been able to develop virus resistance in cucurbits by cloning zucchini yellows mosaic virus and introducing portions of the viral coat protein into the genome of melon. She has also investigated mechanisms of resistance to potyvirus in cucumber and has identified host proteins that interact with specific viral proteins. Another line of research has utilized genes that control ethylene production/perception to modify sex expression in cucurbits.


Rebecca Grumet

Numerous environmental factors interact with genetic pathways to trigger flowering at the time of year most conducive to fertilization and subsequent fruit/seed production. During the last 15 years impressive advances have been made in understanding the genetic aspects of this process, largely as a result of studies with *Arabidopsis thaliana*, a small, weedy relative of mustard. **Steven van Nocker's** (Ph.D. Wisconsin, '93) team has found that some of the genes controlling flowering time in *Arabidopsis* also occur in, or are closely related to, genes in plants of agricultural importance. This knowledge should make it possible to regulate the timing of flowering in horticultural crops, and to breed new cultivars with novel flowering traits.


Steve van Nocker

Genomics. A useful tool now used by geneticists and breeders is genomics – the mapping, sequencing, and analyzing of the genes in a plant, known collectively as the genome. In addition to her breeding work, **Iezzoni** used genomics to determine the relationships among species within the genus *Prunus*. She and her students quantified certain characteristics, such as leaf venation and serration, and used the data to draw 3-dimensional graphs, one characteristic on each axis, to show how closely related the species are. In 2004 **Ning Jiang** (Ph.D., University of Georgia, 2002), a specialist in this area of research, joined the Department, and will devote full time to genomics. Her specialty is the study of transposable elements, or "jumping genes," which can move within and among the chromosomes, and therefore have a major potential in affecting evolution.


Ning Jiang

Herbicides, Growth Regulators, Endogenous Hormones

Experiments with hormones, both synthetic and naturally occurring, have been an important part of research at MSU since the first trials with the herbicide 2,4-D in the 1940s.

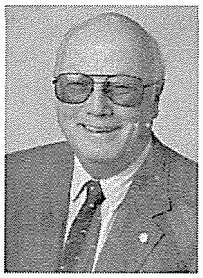
Herbicides. Prior to the 1940s few chemicals were available for controlling the growth of weeds. Inorganic salts and some caustic compounds, such as oils, could be used on selected crops, but for the most part farmers were dependent on mechanical means, using hoes and cultivators. In 1944 USDA researchers at Beltsville, Md. and **Charles Hamner** and **H. B. Tukey**, then at the Geneva (Cornell) Experiment Station in New York State, published papers in the *Botanical Gazette* describing the herbicidal activity of the synthetic growth regulator, 2,4-dichlorophenoxyacetic acid (2,4-D). (The controversy over who was first to observe its herbicidal activity continues to this day.) These reports stimulated an explosion of work on the effects of 2,4-D and its derivatives as herbicides, and the conditions affecting response. In general, the compound was effective on broad-leaved weeds (dicots), but not on monocots, such as grasses, and therefore was useful on lawns and fields of grain, but not on such crops as tomatoes and beans.


Charles Hamner.

Hamner and Tukey continued the work on herbicides after moving to Michigan State in 1945, and were joined in the effort by **Robert Carlson, James Moulton,**

and others. **Carlson**'s special interest at the time was strawberry culture. Much of this work dealt with cultural methods.

By the early 1950s other compounds, including diquat, paraquat, and substituted phenols, were available, and many new herbicides were being introduced by chemical companies. **Stanley Ries**, ('50), who joined the Department in 1953, had studied herbicides in detail during his Ph.D. program at Cornell, and began a program in weed control. At the time Stoddard's solvent, used in dry cleaning, was being used on carrots, and dilute sulfuric acid on onions. One of the chemicals found to be effective as an herbicide was simazine, and Ries noted that the leaves of peach trees appeared to be greener following soil treatment. This led to a series of experiments showing that this chemical not only reduced competition from weeds but also stimulated growth and increased plant nitrogen content. Wheat and oat seeds from simazine-treated plants contained more protein, and produced higher-yielding plants. Ries obtained support from the National Institutes of Health to pursue further research on this subject in the United States, as well as in Mexico, Turkey, and Indonesia. Subsequently Ries and coworkers demonstrated that simazine induced the formation of the long-chain alcohol triacontanol, which increases crop yields at extremely low concentrations (see below).


Stanley Ries

Alan R. Putnam (M.S. '63, Ph.D. '66) became a faculty member on completion of his Ph.D. with Ries in 1966. From the testing of herbicides and investigation of their metabolism, he moved to research on allelopathy – the inhibitory effect of one species on the growth of others – which was stimulated by environmental concerns about the use of synthetic compounds in agriculture. Sorghum residues proved especially useful in this respect. When sorghum plants were chopped and incorporated into the soil, subsequent growth of weeds was inhibited. Putnam directed a team of graduate students and post-docs searching for fungal and higher plant products that either promoted or inhibited plant growth. Such chemicals may someday replace the synthetic compounds whose use alarms environmentalists. Putnam's work in allelopathy was recognized by the American Society of Plant Physiologists in awarding him the Sterling B. Hendricks Award in 1985.


Alan R. Putnam


Muralee Nair

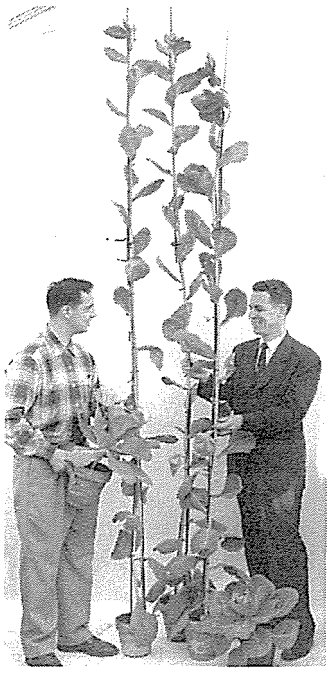
Among Putnam's associates was **Muraleedharan Nair** (Ph.D., University of W. Indies, Jamaica, 1984), an organic chemist, who was instrumental in isolating and identifying the compounds responsible for the allelopathic effects. Among the compounds isolated from fungi was faeriefungin, which was highly toxic to bacteria and fungi. However, it was too toxic for commercial use. Nair is currently isolating plant compounds related to human, animal and plant health, such as those that may prevent diabetes, cancer and other disorders (see below).

Growth promoters

Gibberellins (GAs). The gibberellins (GAs), which have dramatic effects on growth of plants, were discovered in Japan in the 1920s, but did not become available in the United States until after World War II. Today over 100 different GAs have been identified. No work was done with these chemicals in the States until the late 1940s. USDA scientists **J. W. Mitchell** and **P. C. Marth** had experimented with effects of GA-containing extracts, but had not published their results, and the work was dropped soon after WW II ended. Apparently there was no further interest, so they did not pursue potential practical applications.

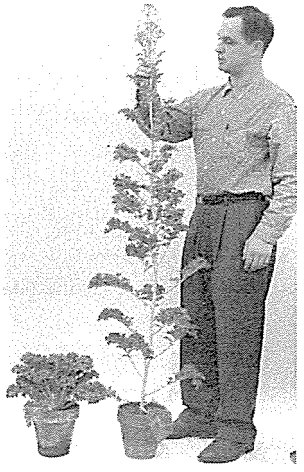
Sylvan Wittwer was able to obtain 100 milligrams of one of the gibberellins (GA_3) from **Frank Stadola** of the USDA in the early 1950s, allowing Wittwer and then graduate student John Bukovac to "get in on the ground floor" on research with these compounds. Soon after completion of his doctorate at MSU in 1957, **Bukovac** was invited to present a series of lectures in Tokyo. While there he visited the laboratory of **Dr. Sumiki** at Tokyo University, where the GAs had been isolated, and where work on elucidation of their structures was in progress. Here Bukovac was given samples of GA_3 and several other gibberelllins. The results of experiments with a range of horticultural plants were dramatic; the duo published many papers in scientific journals and grower publications between 1955 and 1957. They were the first to report the effects of the chemicals on fruit set, vegetative growth of grasses and vegetables, and flowering of geranium, cosmos, and other plants. They were much in demand as seminar speakers, and received numerous research grants in support of their work. Wittwer's sense of the dramatic is well represent-

ed in a photograph of a cabbage plant 12 feet high, produced by serial applications of GA, published in *LIFE* Magazine (3 June 1957, p. 115). A major contribution was the publication of a paper in *Nature* in 1958 on the relative biological activities of the 9 gibberellins then known. Another was a study of the comparative effects of GA, seed vernalization, and photoperiod on flowering of lettuce published in *Science* in 1968; this was selected as one of the classic papers in horticultural science in a book of the same title, edited by **Jules Janick** of Purdue University and published in 1989.



Bukovac and Wittwer evaluating effects of GAs on cabbage.

Today gibberellins are used commercially for stimulating growth and development of numerous crops; for example, they stimulate growth of seedless grapes, reduce excessive flowering in fruit trees, and hasten the malting process in barley. **Bukovac** demonstrated that GAs could partially inhibit flowering in sour cherry. This favors shoot growth, thereby overcoming the effects of viruses, which reduce both growth and yield. GAs are currently used extensively for these purposes by commercial growers in Michigan.



Bukovac with kale.
Left - control;
right - treated with GA

Although the chemicals are not GAs, **Wittwer, Fred Teubner** and graduate student **Jane Shen** tested a number of N-aryl phthalamic acids, such as N-m-tolylphthalamic acid, on flowering of tomato. These chemicals both hastened flowering and increased the number of flowers in the first cluster.

Ethylene and Ethephon. In the late 1960s the USDA agricultural engineering group at MSU, directed by **Jordan Levin**, developed a shaking device to harvest cherries. This was an outgrowth of similar projects in which they were involved, including harvest of nut crops in California. Levin made many advances, testing prototype machines. Bukovac and his students, while focusing on the physiology of fruit abscission, tested a number of chemicals for their effects in fruit "loosening" – stimulation of abcission to facilitate mechanical harvest. The compound found to be most effective was 2-chloroethyl-phosphonic acid, later called ethephon, which decomposes in the plant tissue, releasing the gaseous, naturally occurring, plant hormone ethylene.

The effects of ethylene on plants, including the stimulation of fruit ripening and defoliation, had been known for many years, but application of a gas would be extremely difficult under field conditions. However, ethephon can be applied in solution, thus providing a practical way of delivery. One drawback with ethephon is that its decomposition is very temperature-sensitive; if the temperature rises 10°C, about eight times as much ethylene is released. Thus a much greater response is obtained when it is applied at high temperatures. Bukovac and his students conducted many experiments over several years on the physiology of fruit abscission. This was coupled with evaluation of the effects of ethephon concentration and time of application on fruit removal force, and on quality of the harvested product, in order to develop recommendations for commercial use in the fruit industry. Its application has now become standard practice for mechanical harvesting of cherries in Michigan; harvest of sweet cherries especially would be very difficult without ethephon.

Ethylene induces many other responses in plants. **Ross Byers**, then a post-doc, and **Baker, Dilley, and Herner,** were among the first to observe that ethylene promoted the development of female flowers in cucurbits, whereas gibberellins promoted maleness. This led to the discovery of the role of endogenous ethylene in sex expression. Petal abscission during shipment in closed vehicles is a serious problem with flowering annuals, such as geranium, as this reduces their sale value. **Arthur Cameron** and others have used applications of silver thiosulfate, which antagonizes the action of ethylene, to delay petal abscission during transport of species such as geranium, providing the flower industry with a potent tool for improving sales.

Growth Retardants. In the mid-1950s Sylvan Wittwer and colleagues reported inhibition of sprouting of onions and potatoes following preharvest foliar applications of maleic hydrazide; this became a commercial practice. Wittwer and **Richard Lindstrom** also

Effect of maleic hydrazide on sprouting of potatoes.
Left: Treated with MH; *Right:* No treatment.

cooperated with **Edward Tolbert** in Biochemistry in studies of the effects of [(2-chloroethyl) trimethyl] ammonium chloride (chlormequat, CCC) in inhibiting stem elongation both in flower crops and grain plants, thus reducing lodging. The introduction of short stemmed lines has reduced this problem in grains.

In the 1960s several new growth retardants became available. **Alvin Kenworthy** and his students evaluated the effects of daminozide (Alar®; succinamic acid, 2-2-dimethyl hydrazide) on both tart and sweet cherries. Treatment with Alar stimulated ripening in these fruits, but **David Dilley** and his technician, **William Austin**, showed that it had the opposite effect on apples, delaying both ripening and pre-harvest drop. **Frank Dennis** and others evaluated its effects on several cultivars of apple, and it was used commercially for a time on both species. However, the Natural Resources Defense Council, an organization that claimed to represent consumers, reported that the compound was carcinogenic, whereupon the manufacturer withdrew it from the market. (It was later shown to be no more carcinogenic than peanut butter!) More recently, another compound that both inhibits ethylene production and delays ripening, aminoethoxyvinyl glycine, marketed as Retain®, has been used to delay ripening of apple fruits, both on the tree and off. (See Ch. 3 for more on ethylene.)

Control of Fruit Set and Fruit Abscission ("Thinning"). Chemicals were first tested for reducing crop load, thereby increasing fruit size and quality, as early as the 1920s. In general, the chemicals used were caustic; they damaged the flowers and/or young fruits, thereby preventing further growth. In 1947, MSC researchers reported that wax emulsions were effective in thinning cherry, apple and pear. One year the researchers reported that "Many growers used these wax sprays on cherries with astonishing results." However, subsequent work indicated that they were less effective than synthetic auxins, such as napthaleneacetic acid (NAA). The first report on the effectiveness of such compounds by MSC researchers was published in 1947 in the annual report; both NAA and 2-methyl-4-chloro-phenoxyacetic acid were used by **A. E. Mitchell, C. Hamner** and **W. Toenjes** to delay preharvest fruit abscission; NAA also "pre-thinned" apple fruits. Additional compounds, concentrations and timings, as well as the addition of compounds (surfactants) that improved "wetting," were evaluated in subsequent experiments by these and other workers. NAA remains the primary chemical used commercially for this purpose today. Additional compounds, such as carbaryl (Sevin®, 1-N-naphthyl phthalamic acid) and benzyladenine (BA), have proven to be effective, with or without NAA. Work with peaches was less successful, as compounds that thinned fruits also induced leaf abscission. **Bukovac, Hull,** and Dennis were active in this area of research.

Response to abscission-inducing chemicals is influenced by numerous factors, both genetic and environmental. **Steven van Nocker** and his students are investigating the genetic control of abscission in apple flowers and fruit. An apple gene (JOINTLESS), also found in tomato, prevents abscission of ripe fruit. This gene might be manipulated to reduce premature drop in apple. A second approach is the use of microarray analysis to identify apple genes that are active during abscission, with the aim of developing new strategies for thinning. In addition, van Nocker and his team are cataloging natural variation in fruit abscission-related traits among both cultivars and wild species of apple, with the ultimate goal of constructing linkage maps to locate these traits. Such maps could be used to breed novel cultivars with abscission-related characteristics.

Improving the Effectiveness of Growth Regulators. Most of the pesticides used on plants are active on the surface; they need not enter the tissue to be effective. Insects, fungi, and bacteria can be killed on the surface, whereas growth regulators (GRs) must penetrate the leaves and/or fruits. Both of these organs are protected by a cuticle – a waxy deposit on the surface that limits water loss as well as penetration by aqueous solutions. The GR must penetrate this layer to have the desired effect. In addition, response is dose-dependent. Many orchard sprayers tend to deliver smaller amounts of spray to the top of a tree than to the bottom, often resulting in less than adequate dosage in the top and excessive dosage in the bottom. Thus, when apple trees are sprayed with GRs, response is often unpredictable and varies from the top to the bottom of the tree.

Using both physical and chemical methods, combined with electron microscopy, and both field and laboratory studies, Bukovac and his students and postdocs analyzed the composition and structure of the

cuticle of several species of plants. In addition they measured penetration by GRs and other compounds, as well as the effects of environmental conditions, pH, droplet size, and surfactants (additives that reduce surface tension). These studies revealed much about the nature of the cuticle and the reasons for differences in response under orchard conditions. In the course of these studies, **Bukovac** and coworkers developed laboratory techniques that have become standard methods for similar studies by other investigators.

Spray Application Technology. **Arthur Mitchell** worked with fruit growers in adapting to the introduction of the concentrate sprayers that replaced dilute machines for delivery of pesticides. (See pesticide section below.)

In addition to his research with growth regulators, Bukovac cooperated with agricultural engineers at the Ohio Agricultural Research and Development Center at Wooster in studying the effects of changes in spray application equipment to improve uniformity in application and increase the absorption of GRs, while minimizing the amount of chemical wasted or left behind as a pollutant. This work resulted in improved sprayers that delivered the chemical more uniformly, with less run-off. It also provided a basis for continuing studies by both chemists and agricultural engineers to develop better surfactants for, and formulations of, GRs, as well as better spray equipment. This two-pronged approach to the problem led to contributions in both applied and theoretical areas.

Endogenous Hormones. Research on endogenous hormones began in the Department in the 1960s and '70s. Students and post-docs working with John Bukovac and **Frank Dennis** explored the roles of endogenous growth substances in a number of physiological processes, including flowering, fruit development, and dormancy of seeds and buds. Those in Bukovac's laboratory concentrated on fruit development in sour cherry. Assays of several of the above hormones were conducted in relation to the three stages of fruit development, and several gibberellins were identified. Dennis's students measured levels of abscisic acid during the breaking of dormancy in buds of sour cherry and in seeds of apple and peach. In no case were levels found to be associated with the stage of dormancy. Studies of gibberellin content and biosynthesis in relation to flowering of apple were inconclusive.

David Dilley and his coworkers have studied the synthesis and role of ethylene in a number of physiological responses, including flower longevity, fruit ripening, and sex expression. Dilley's students, **Mikal Saltveit** and **Kent Bradford,** observed that exposure of tomato roots to low oxygen levels stimulated ethylene synthesis in the tops, indicating that an unknown factor was translocated from the root to the shoot. This was identifed as 1-aminocyclopropane-1-carboxylic acid (ACC), the substrate for ethylene synthesis. Other members of Dilley's team purified the enzyme ACC oxidase, responsible for converting ACC to ethylene, from apple fruits, and found it to be a biochemical marker for ethylene production. Mutagenesis was used to obtain *E. coli* mutants that produce large quantities of the enzyme, allowing identification of binding sites for ACC, CO_2, and ascorbic acid, and elucidation of the reaction mechanism.

Triacontanol. In the course of his evaluation of alfalfa meal as a replacement for nitrogenous fertilizers, **Stanley Ries** observed that the treatment was more effective on growth and yield than could be accounted for based on nitrogen content alone. Extraction of alfalfa tissue led to the isolation of the active component – triacontanol, a 30-carbon primary alcohol. This compound proved to be effective in stimulating growth of test plants in the laboratory at extremely low doses – as low as 10^{-11} M. In early field trials yields of vegetables and grain crops were increased 7 to 22%, using rates as low as 1 to 5 mg per acre. Later research demonstrated that application of triacontanol stimulated the production of L(+)-adenosine in the root system. This then moved to the shoot, and was responsible for increased growth.

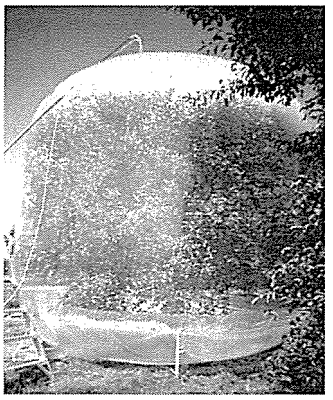
Response was very reproducible in the laboratory, but variable in extensive field experiments. In some cases, marked responses were observed at doses as low as 1 gram per acre; in others, there was no response. Despite these unpredictable results, large acreages of grain crops were treated in China, India, Indonesia and Korea.

Photosynthesis, Soil Management, Nutrition/Water Relations, Stress

Photosynthesis. Essentially no research was done in the Department on photosynthesis, per se, until the mid 1980s, when James **Flore** ('68, M.S. '73, Ph.D. '74) obtained the necessary equipment to measure gas exchange, using leaf chambers. He and his students evaluated the effects of environmental conditions, including light, temperature, and carbon dioxide level, as well as various stresses – drought, anoxia, low temperature, fruit load – on photosynthesis of both individual leaves and of whole, potted trees. To determine the threshold of injury by leaf-eating insects required to affect carbon assimilation, they simulated the injury by mechanically re-


James Flore

moving various amounts of leaf surface. When systems using large plastic bags to enclose whole trees became available, experiments were conducted with large trees under orchard conditions.

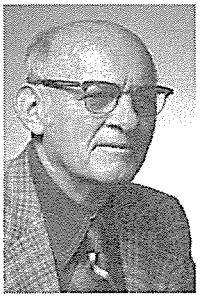


Sour cherry tree enclosed in plastic bag to measure rate of photosynthesis.

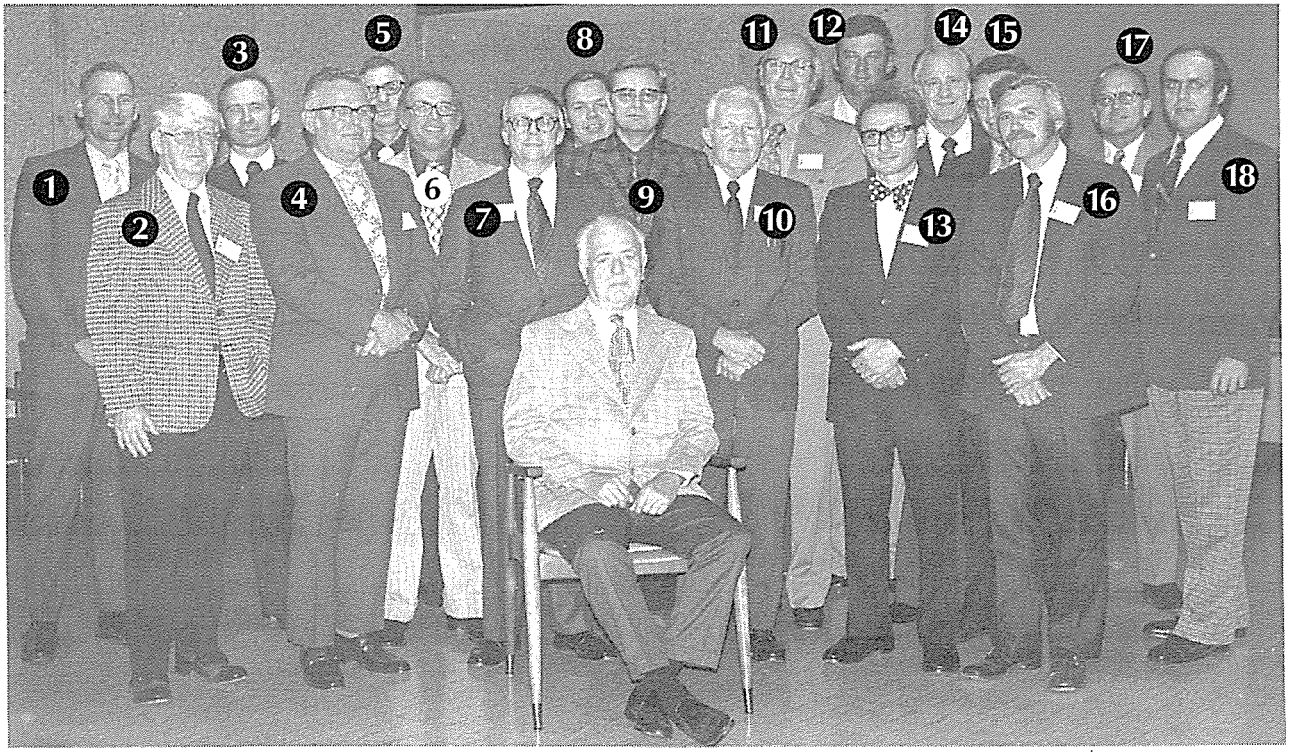
Plant Nutrition and Water Relations. Robert L. Carolus was a plant physiologist at the Virginia Truck Experiment Station, Norfolk, Va., prior to his appointment as professor at MSC in 1945. His work in Virginia involved mineral nutrition of numerous vegetable crops, particularly potassium and calcium, and the effects of temperature, fertilization, and storage. At Michigan State, he continued his work on mineral nutrition, and studied the cause of bitterness in carrots, as well as the use of pelleted seed, plastic films and various methods of irrigation. He helped reduce losses from the serious problem of blotchy ripening in tomato, cooperated with **Keith Barrons** in introducing field snapping of asparagus, and tested the use of evaporative cooling of beans and other crops to reduce moisture stress, thereby improving yields. He was noted for "always promoting something new," including the pre-packaging of vegetables in plastic. Carolus was famous among his graduate students for late-night sessions critiquing their theses. He was a stickler for precision in writing, and theses often had to be rewritten four or five times before they met his criteria for acceptance. He served as associate editor of the *American Vegetable Grower* from 1953 to 1967, and had foreign assignments in Nigeria, Bangladesh, and Pakistan. He retired in 1974.

Robert L. Carolus

Alvin L. Kenworthy was responsible for nutrient analysis and water needs for tree fruits in Michigan. Leaf analysis, as a supplement to soil tests, was first used in Michigan in 1950, and was introduced as a service for growers in 1954. Samples were analyzed, the data interpreted, and the results sent to the grower with suggestions for fertilizer use. Analysis of 10 elements was available by 1955, and the service had been extended to include apple, pear,



Alvin Kenworthy

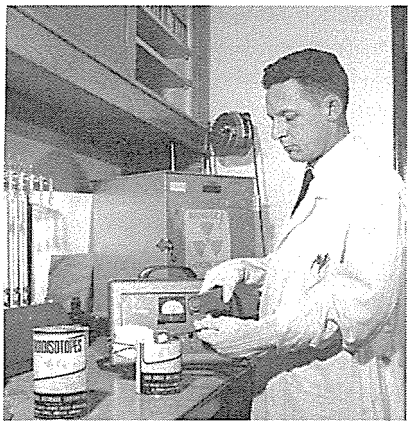


Dr. Carolus with some of his former graduate students at retirement symposium, 1974. 1 - F. Richey; 2 - R. Earl; 3 - Wm. Robb; 4 - J. Lengle; 5 - H. Belter; 6 - H. Schmalfeld; 7 - L. Brown; 8 - B. Bible; 9 - J.Riekels; 10 - J. Downs; 11 - S. Ries; 12 - J. Dellis; 13 - W. Lipton; 14 - H. Tiessen; 15 - J. Kelly; 16 - A. Putnam; 17 - N. Reath; 18 - S. Van Single.

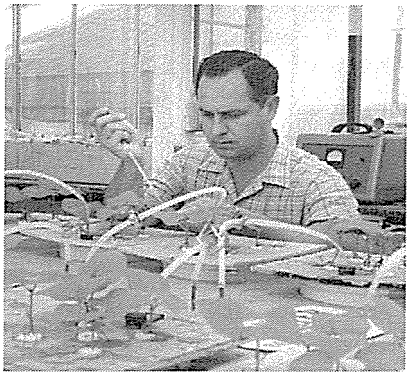
peach, cherry, grape, blueberry, strawberry, and raspberry. Initially, all samples were analyzed "by hand." In 1959 a $40,000 direct reading spectrograph was purchased for use in determining the levels of many of the nutrients, reducing the need for labor and greatly accelerating analysis. This appears to have been the first installation of such an instrument in a U.S. college or experiment station, prior use being primarily in the iron and steel industry. As it weighed more than a ton, a crane was required to lift it to the 3rd floor of the Horticulture building.

Beginning in the 1970s, **Kenworthy** investigated trickle irrigation as a means of supplying water to fruit plants. The system, developed in Israel and quickly adopted in California, delivers the water to a small area near the roots of the plant, rather than over the entire ground surface, thus greatly reducing the quantity of water required. These studies were the basis of recommendations that many growers use today. Kenworthy and one of his graduate students, **Charles Kesner** (M.S. '62, Ph.D. '66), when he later became District Fruit Agent in the Traverse City area, evaluated the use of trickle irrigation to provide both water and nutrients ("fertigation") to orchards on sandy soils. This also reduced the quantity of fertilizer required in comparison with broadcast applications.

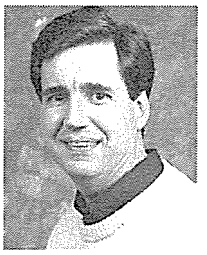
Foliar Feeding. In the 1950s and '60s research grants from the U.S. Atomic Energy Commission totaling some $100,000 were obtained by **Sylvan Wittwer** to study the absorption and transport of radioactive elements and compounds by plants. Wittwer, together with his students and postdoctoral fellows, including **John Bukovac**, conducted experiments exploring the absorption, leaching, and transport of such elements following application to leaves, stems, and fruits of bean and other species. They compared the rates of absorption of 14 essential nutrient elements, and reported that sodium, rubidium and potassium were readily absorbed and highly mobile. Calcium, magnesium and strontium were absorbed, but not exported, whereas the remaining elements were less readily absorbed. This led to recommendations on "foliar feeding" of plants – using sprays to apply nutrients.


Wittwer using radioactive isotopes

The work was received with skepticism at first, but was later widely acclaimed in both the applied and the basic sciences, and led to an invitation to Wittwer to write a review paper in the *Annual Review of Plant Physiology*. In 1958, the Atomic Energy Committee provided support for production of a 15-min. color movie on use of isotopes, filmed in Wittwer's lab, narrated by **Lowell Thomas**, and shown at the Second International Conference on Peaceful Uses of Atomic Energy in Geneva, Switzerland. Bukovac and Wittwer's 1957 paper on absorption and mobility of foliar applied nutrients, published in *Plant Physiology,* was selected as a "Citation Classic" by *Current Contents* (February 18, 1985), after having been cited in more than 130 publications between 1957 and 1985.

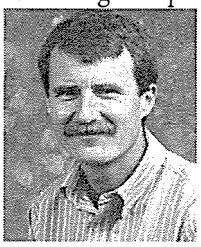

Bukovac applying radioactive compounds to bean leaves.

Irvin E. Widders joined the Department in 1982 following completion of a Ph.D. at the University of California, Davis. He worked closely with **Bernard Zandstra, Hugh Price** and botanist Ray Hammerschmidt on the problems of the cucumber/pickle industry, including fruit set, calcium status, textural quality ("crunch"), excessive carpel separation, and systemic acquired disease resistance. Both growers and processors were very supportive. Field and greenhouse studies demonstrated that drought stress slowed fruit growth while increasing seed size, an undesirable effect.


Irvin Widders

Widders and graduate student **Jean Long** developed a new method for measuring ion content in the intercellular spaces of pea leaf tissue. The breakthrough was the use of a pea mutant with an epidermis that could be readily detached to expose the underlying tissue so that ion changes could be measured. **Widders**, together with **Karen Klomparens** in the Center for Electron Optics, developed a methodology for x-ray analysis of ion concentrations in frozen, hydrated tissue.

Eric Hanson began work at MSU in August 1984, following completion of his Ph.D. program at Oregon State University. Boron had been considered to have low mobility, but Hanson, using a tracer form, demonstrated that this element moves very quickly out of the leaves of apple, cherry, and pear. He found that boron sprays often increased fruit set of sour cherry even when leaf boron levels appeared sufficient (above 20 ppm), but no response occurred if leaves contained more than 30 ppm.


Eric Hanson

Hanson's graduate students investigated the nitrogen requirements of blueberries by applying ^{15}N-labeled fertilizer to the soil at budbreak. Thirty-five percent of the ^{15}N was recovered by the plants; the remainder appeared to be lost to leaching. Applying ^{15}N- fertilizer at 2-week intervals revealed minimal absorption before bloom, but high demand from bloom through harvest – a period of 2 to 3 months. This illustrated that more than one application was needed to maintain available N throughout this time period.

Nitrification – the oxidation of ammonium to nitrate – is thought to be minimal in blueberry soils because high acidity inhibits the activity of nitrifying bacteria. However, Hanson and his students found high soil nitrate levels following application of ammonium fertilizers. Comparing the nitrification capacity of older blueberry soils with that of non-cultivated forest soils in woodlots adjacent to blueberry soils showed that the blueberry soils had higher nitrification rates and higher populations of nitrifying bacteria, which convert ammonium to nitrate. This favors leaching and again suggests that multiple applications of N may be more effective than single ones. (See Greenhouse Crops section for additional research in nutrition.)

Resistance to Stress. Application of salt to highways in Michigan is a standard practice for preventing ice formation, but salt spray is atomized and deposited on roadside trees, where it can cause dehydration of the needles of conifers, resulting in leaf drop and eventual death of the tree. In the early 1970s **Harold Davidson** and graduate student **Luther Moxley** determined the resistance of several species of trees to such deposits. Existing trees were evaluated for injury, and additional species were planted for observation. Some trees, such as Austrian pine, were resistant to injury, while others, including white pine, were highly susceptible.

Wayne Loescher and his post-docs have also studied plant response to salt stress, concentrating on its effects on metabolism of several sugar alcohols, e.g., sorbitol and mannitol, using celery as a model system. When exposed to elevated concentrations of sodium chloride, celery plants produce large amounts of mannitol, which increases the osmotic potential of the cell. The increase in the level of mannitol is assumed to be responsible for the increased resistance to dehydration.

The actions of several enzymes were followed, and the gene for mannose 6-phosphate reductase (M6PR) was cloned and sequenced. To test the hypothesis that mannitol is responsible for resistance to salt stress, the celery gene was inserted into *Arabidopsis thaliana*, which does not produce mannitol. The transformed plants both accumulated mannitol and were resistant to salt stress, suggesting that introduction of this gene into commercial species of plants might permit their production on soils with high salt content.

Since coming to MSU from Washington State University in 2000, **Suzanne Lang** ('77) has focused her research efforts in the area of integrated crop management, with emphasis on stress physiology of turfgrasses. She is evaluating the application of carbohydrates and of plant growth regulators to improve the resistance of turfgrass to shading and wear in home lawns, sport-turf, and golf courses. She is also testing the effects on turfgrass growth of application of leaf mulches prepared from broadleaved tree species; this would also provide a way for municipalities to recycle autumn leaves. An additional advantage, yet to be confirmed, appears to be inhibition of the growth of broadleaved weeds, such as dandelion.


Suzanne Lang

Stone Fruit Decline Project. In the mid-1980s Federal funding was obtained for research on stone fruit decline with the goal of identifying the reasons for this phenomenon. This was an interdepartmental project, with professors from Horticulture, Botany/Plant Pathology, Entomology, and Agricultural Engineering. Participating Horticulture personnel included **James Flore**, who served as principal investigator, **Stan Howell, Amy Iezzoni, James Hancock** and **Ronald Perry**, and their graduate students. Research focused on problems with peach, cherry, and plum, with emphasis on: diseases such as canker and X-disease; insect infestations, including American plum borer; cold hardiness; viruses and nematodes; tolerance to flooding; photosynthetic efficiency as affected by defoliation and water stress; and injury during mechanical harvest.

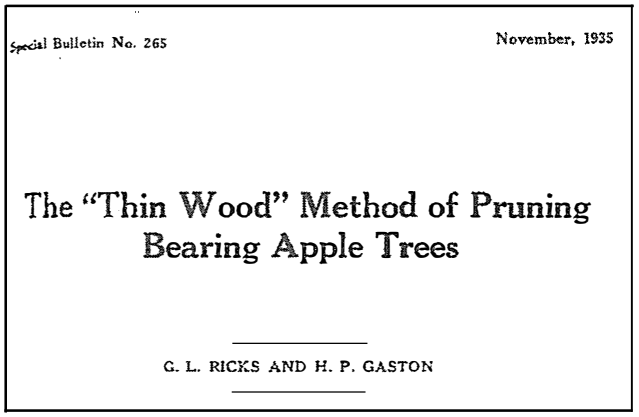
Among the results were the following: a) decline of plum trees was associated with virus infection; b) ground covers of endophytic rye reduced the population of leafhoppers, which are vectors of the virus responsible for X-disease; c) inoculation of peach trees with avirulent

pathogens reduced the effects of *Cytospora* canker; d) use of a synthetic pheromone, together with properly timed applications of insecticides, permitted control of American plum borer; e) irrigation, treatment with ethephon, shading, heavy cropping, and severe drought all reduced cold hardiness; and g) certain rootstocks improved the hardiness of peach trees.

Pruning and Training

Prior to 1900, work on pruning and training was limited and most of the systems used were similar. When spraying became necessary to maintain fruit quality, tree height had to be controlled by removing upper limbs that were difficult to reach with available equipment, but the training system itself changed little.

One of the first mentions of work on pruning methods for tree fruits at MAC was the "thin-wood" method for apple trees introduced by **Glenn Ricks** (M.S. '33) and **Harold Gaston** (M.S. '27) in the mid-1930s. They observed that over 85% of the fruit was produced in the top and outer portions of trees, and that fruit from the lower and central parts was inferior because of poor color and small size. Therefore they recommended removal of "thin wood" – branches in which 4-year-old wood was less than ¼" in diameter - in the lower and inner parts of the tree. According to Gaston this "took the country by storm" and he and Ricks were called upon to present many lectures and demonstrations on the new method.


Special Bulletin No. 265 November, 1935

The "Thin Wood" Method of Pruning Bearing Apple Trees

G. L. RICKS AND H. P. GASTON

In the 1960s large machines equipped with circular saws became available for hedging orchard trees, and were used by Michigan growers to remove the tops of trees that had become too large. Somewhat later, heavy-duty sicklebar mowers were adapted for use in orchards, and were used for "top and side" hedging, primarily for peach and sour cherry. Much of the preliminary research on sour cherry was conducted by **Charles Kesner** in the Traverse City area, who demonstrated that yields could actually be improved by hedging. **James Flore** compared several hedging and training systems for peach and cherry at the Clarksville Station.


Hedger at Clarksville.

During the 1940s, considerable effort was expended in research on size-controlling rootstocks for apple. Commercial use of semi-dwarfing stocks, such as M.7, required no major changes in pruning practices. However, the use of true dwarfing stocks, such as M.9, beginning in the 1970s, required major changes in orchard design.

Rootstocks

Although the effects of dwarfing rootstocks on the size of fruit trees had been known from Roman times, little scientific attention was devoted to them until 1912, when scientists at the East Malling Research Station in England began a detailed study of their characteristics. They collected many apple rootstocks from around the world and classified them according to their effects on growth, from the most (M.27, M.9) to the least dwarfing (M.16 = seedling). This research had very little effect on commercial practices in the United States at that time. In the third edition of their book *The Fundamentals of Fruit Production*, published in 1952, **V. R. Gardner**, et al., barely mentioned rootstocks. Today, the author of such a textbook cannot ignore them.

Harold Tukey, then at the Geneva Experiment Station in New York, was a pioneer in evaluating the effects of such rootstocks upon performance of apple trees in America, and he continued this work when he became chairman of the MSC Department of Horticulture in 1945. One of Tukey's assistants at Geneva was **Robert Carlson**, who joined him at MSC in 1946. Here he continued the research begun at Geneva, including methods of propagation of these clonal rootstocks.

In 1956 Carlson helped establish the first large-scale commercial planting of apples on size-controlling rootstocks at the **Ray Klackle** farm near Belding, Mich.

In 1976, Carlson, together with faculty members from several other Midwestern institutions, established

the North Central Pome and Stone Fruit rootstock testing program (NC-140). Protocols were established for comparing the same cultivar-rootstock combinations in many states and provinces. NC-140 has become the model for all regional projects in the United States.

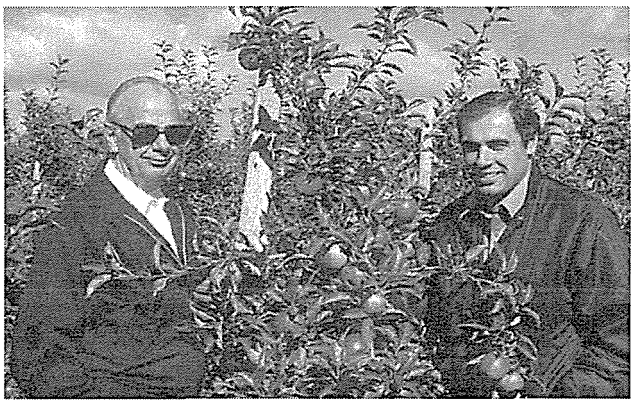
All of the commercially available clonal apple rootstocks were developed in Europe, so **Carlson** propagated trees from seeds of three clones (M.9, Robusta 5 and Alnarp 2) with the aim of producing rootstocks that were better suited to Michigan conditions. From the 2000 seedlings obtained, he selected 18 with superior qualities for rootstock use. Of these, one, called MAC 9 (for Michigan Apple Clone, later changed to MARK), was released for commercial use in 1979. The rootstock was widely planted and proved to be productive, but was found to have some critical flaws, including "root mass proliferation" (apparently induced by propagation in vitro), susceptibility to woolly aphid, and brittle unions. For these reasons, the stock is not used commercially today. However, based on the work of Carlson and others, growers began planting this and other dwarfing stocks, such as M.9, and experimenting with high density plantings and support systems. In North America, the change from low to high density systems for apple was accelerated, in part, by tests with MARK.

Apple tree on MARK rootstock trained to slender spindle system

When **Ronald Perry** became a member of the Horticulture faculty in 1980, he continued the research on rootstocks that Carlson had begun. At that time, mid-Western fruit growers were using primarily the semi-dwarfing M.7 and M.111 apple rootstocks, and most trees were not supported with stakes or trellises. During the last 10-15 years there has been a slow movement toward the use of M.9 and M.26 rootstocks (dwarfing), most of which require support. Perry visited several countries in Western Europe, and was impressed with the vertical axe training system developed in France. In comparing different systems in Michigan, he found the vertical axe to be more efficient and productive than the central leader or slender spindle – with relatively minor inputs.

Growers are discouraged from planting fruit trees, particularly sour cherries and peaches, on heavy or shallow soils, but this practice continues. Perry found that the problem was particularly severe with cherry trees on Mahaleb rootstock, and advised growers to use M X M 2 and M X M 60 – Mazzard X Mahaleb hybrids – which are more tolerant of such soils.

In 1987, Perry and fifteen other NC-140 investigators organized the first cooperative testing of several dwarfing rootstocks for sweet cherry in North Amreica. Gisela clones from Giessen, Germany proved to be extremely productive and precocious; tree size was reduced as much as 50%. This is a considerable advantage, as sweet cherry trees are normally 15 to 25 feet in height. In addition, precocious production dramatically improves income for growers, as more than a decade is often required to recoup the costs of bringing a sweet cherry orchard into bearing. One disadvantage of such rootstocks is overcropping, resulting in small fruit, limb breakage, and excessive restriction of growth.



Carlson and Perry with dwarf tree.

Ron Perry with Hedelfinger sweet cherry trees on Mazzard (*left*) and Gisela 152 (*right*) rootstocks.

Chapter 3

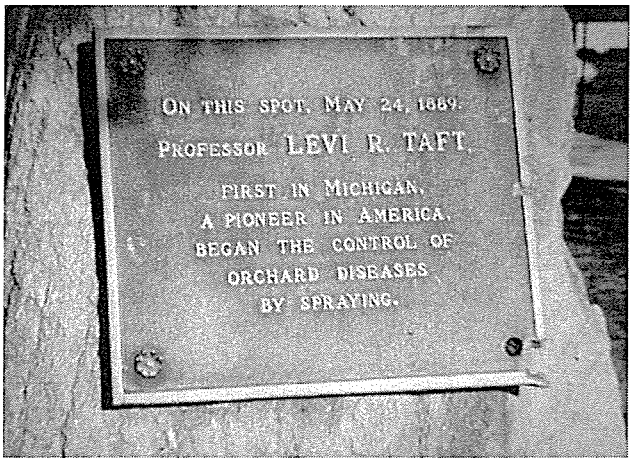
Searching for Answers - Research II

Pest Management

Few chemicals were available to control insects and diseases prior to the 1880s, and consumers were used to removing the worms from their fruits and vegetables. As marketing became more competitive and consumers more particular, the need arose for better methods of control. In the 1880s **A. J. Cook** in Entomology experimented with insecticides and **L. R. Taft** tested fungicides for control of apple scab.

As professor of Horticulture at Missouri Agricultural College, Taft had begun work on orchard spraying – a practice still in its infancy. Some work had been done in California on spraying to control orchard insects, but little was known about the control of diseases. While in Missouri, Taft began testing copper compounds for control of scab, the most common disease of apples, then as now, and continued these studies at MAC. Here he was to publish the first report in Michigan on successful control of this disease with chemicals. One of five treatments was applied to each of two 'Northern Spy' trees in the College orchard, using a nozzle attached to a pole. "Eau celeste" (a solution containing copper sulfate, sodium carbonate, and ammonia) proved most effective, reducing the number of scab-infested fruit from 88% (control) to 12% at an estimated cost of only 25 to 30 cents per tree. Subsequent experiments demonstrated that peach leaf curl, another fungal disease, could also be chemically controlled. Such experiments laid the foundation for current commercial practices, and Taft's work is commemorated by a plaque near the Collingwood entrance to the campus.

Prof. Taft and historical marker near Collingwood entrance to campus at commemoration of first use in Michigan of fungicides to control apple scab.



Work on pesticides continued under both Taft and others. In 1893 cooperative arrangements were made to test fungicides in the orchards of fruit growers in various parts of Michigan. In 1892 the amount of copper sulfate used to control fungal diseases of fruits, including apple, peach, plum, grape, and small fruits, was less than 1000 lb.; this had increased to at least 5 tons in 1893 and to approximately 25 tons in 1894. Working together, Taft and Cook co-authored the first MAC spray calendar for grower use in 1895.

Other faculty members continued this work. W. H. **Dutton** joined the Department in 1913. His primary area of research was control of orchard diseases, including apple scab. Based upon extensive tests with a range of fungicides, he recommended using either Bordeaux mixture (copper sulfate and lime) or lime-sulfur, with lead arsenate added, both to control insects and to enhance the fungicidal effect of lime-sulfur. **R. J. Rasmusson** continued Dutton's work on the latter's departure in 1936, and remained at MSC until 1946, when he moved to New Hampshire.

Horace Cardinell conducted experiments on control of apple scab, using dusts in place of sprays. He obtained very good results one year. He thought he shouldn't withhold the information from the growers, and therefore recommended dusts for commercial use

Orchard sprayer, Fennville, c. 1937.

Duster, c. 1947.

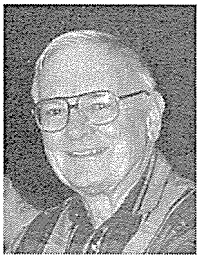
without obtaining a second year's data. The results proved disappointing, and **Cardinell** lost the confidence of the growers. Thereafter he had foreign assignments, primarily in Brazil. He retired in June of 1960, having devoted more time to service abroad than anyone else in the Department.

Arthur E. Mitchell joined the faculty after a chance meeting with Dr. **Tukey** at a National Peach Council meeting in St. Louis in the 1940s. Mitchell was then a Ph.D. candidate at the Ohio State University but was a staff member at the University of Tennessee working on control of brown rot in peaches. This disease was (and remains) a serious problem in Michigan, and Tukey realized the potential contributions that Mitchell could make at MSC. (Incidentally, while at the Geneva, N.Y. Experiment Station, Tukey had collected and preserved the pear samples that Mitchell later used for his Ph.D. thesis at Ohio State on the morphology and histology of pear fruts.)

Arthur Mitchell

From the late 1940s through the 60s, Mitchell, together with faculty members in Botany/Plant Pathology, was one of the fruit grower's respected sources of information on spray materials for orchard use. Mitchell used trees at the Graham Station and at E. Lansing to evaluate the effects of fungicides and insecticides on disease and insect control, as well as on fruit finish. He advised growers during the change from high pressure, hand-gun application of pesticides to the use of low pressure, airblast equipment. This required changes in pruning practices, including reducing tree height and opening the canopy to allow penetration of sprays. In addition, his experiments established appropriate dose levels as low volume, concentrate sprays reduced the volume of water applied. Mitchell died unexpectedly in 1970.

Jerome (Jerry) Hull ('52, Ph.D. '58) who had succeeded **Paul Larsen** as extension specialist for tree fruits in 1968, continued Mitchell's research with tree fruits.



Jerry Hull

Beginning in the 1970s entomologists and plant pathologists introduced the concept of "integrated pest management" (IPM), using scouts to check for the presence of pests, so that sprays could be applied only when needed. Reliance on climatic factors and "degree day" records were used to predict emergence of insect pests, and their presence was monitored. Similarly, plant pathologists developed computer programs, based upon temperature, period of leaf wetting, and rate of trapping of fungal spores, to predict infection by diseases such as apple scab and fireblight. These were major advances at a time when consumers, concerned about the questions raised by **Rachel Carson** in her book *Silent Spring*, were beginning to question the use of pesticides that were harmful to a wide spectrum of species. This approach paved the way for the current "integrated crop management" concept, with its emphasis on a holistic approach, involving several disciplines, including ecology as well as entomology and pathology.

Organic Methods of Apple Production. Public concerns about the effects of pesticides, fertilizers, and other chemicals on human health and the environment have stimulated growers' interest in using organic methods of producing apples. New technologies have made it possible to successfully grow apples organically in Michigan's humid climate and to control numerous insect pests; these include mating disruption, insect growth regulators, and bacterial insecticides. Some commercial growers have adopted these techniques, but many questions remain to be answered.

To evaluate some organic farming techniques, a 5-acre planting of apples was established at the Clarksville Station in the spring of 2000 by team members **Ronald Perry, James Flore, John Biernbaum,** and **Phil Schwallier** in Horticulture, and **Mark Whalon** and **George Bird** in Entomology. They were assisted by additional cooperators from the Horticulture Department (**Bridget Behe,** Amy **Irish-Brown**), the Entomology and Crop and Soil Sciences Departments, the Organic Crop Improvement Association, and Biosystems, Inc., as well as commercial growers. Funds were provided by MSU's IPM and GREEEN programs, the Michigan Apple Committee, USDA, Gerber Food Products, and others.

Two trial plots were established to compare methods of controlling weeds, insects and diseases. The first (0.5 acres) focused on rootstock and ground floor management treatments. 'Gala' trees were established on three rootstocks [M.9 NAKB 337 (dwarfing), M. 9 RB 29 (semi-dwarfing), and Supporter 4 (semi-vigorous)]. The trees were supported by a wire trellis, and three ground management systems -- alfalfa mulch, flaming, and strip tilling on both sides of the row, with natural vegetation in the tree row (= Swiss sandwich system) -- were compared.

The second plot (4.5 acres) incorporated two of the ground floor management systems with one rootstock and three cultivars – Gala, Smoothie Golden Delicious and Goldrush (scab resistant).

The primary results obtained by 2005 indicated that: 1) apple scab was difficult to control using organic methods, therefore scab-resistant cultivars, such as Goldrush, are recommended; 2) the "Swiss sandwich strip" was the most economical ground management system; 3) a 16'- wide peripheral ("diversity") strip containing perennial herbaceous plants helped control curculio infestation; 4) mating disruption with sex hormones reduced the need for insecticides in controlling codling moth; and 5) although costs for insect and weed control were greater by about 20% than for non-organic methods, the results were encouraging for organic production of apples in Michigan.

Research with Greenhouse Crops

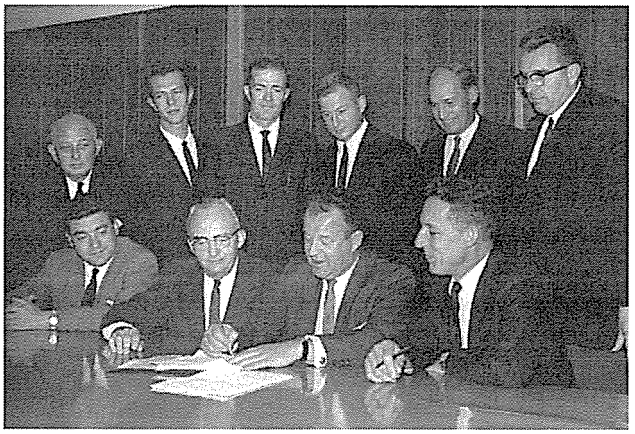
Effects of Photoperiod. In the late 1920s, **Alex Laurie, Kenneth Post,** '27, and **Gustave H. (Gus) Poesch,** who were then at MSC, made important observations regarding the response of floriculture crops to photoperiod. The story goes that a chrysanthemum grower asked the professors for help in solving a puzzling problem. Although he had treated all of the plants in his greenhouse similarly, none of those in the front of the house flowered. Laurie and his colleagues investigated the situation, and noticed that the city had recently installed streetlights near the front of the greenhouse. Aware of **W. W. Garner** and **H. Allard**'s observations on photoperiodism in tobacco, they wondered if chrysanthemums might react similarly. Thus began MSC's involvement in floriculture research. However, Laurie resigned when, according to **Gardner**, "Ohio State offered him a position that he couldn't refuse." There he and Poesch continued their studies on photoperiodism. Post moved to Cornell, where he, too, in experiments begun in 1930, investigated the phenomenon and refined the treatments, publishing an oft-cited paper on the use of black cloth to reduce the daylength, thereby inducing flowering.

Light Intensity. William J. Carpenter (M.S. '51, Ph. D. '53) returned to MSU in 1968 after 15 years as a professor in the Horticulture Department at Kansas State University. One of his major research interests was the effect of light intensity on the growth of greenhouse crops. Illumination with high intensity sodium vapor lamps hastened flowering of chrysanthemum, rose, petunia and several other species, especially under low natural light intensities in the winter. Carpenter also tested chemicals for stimulating branching and for extending the vase life of cut flowers. In 1975 he became chair of the Ornamental Horticulture Department at the University of Florida at Gainesville.


William Carpenter

Carbon Dioxide Enrichment. Sylvan Wittwer pioneered in studies of CO_2 enrichment of greenhouses to stimulate growth and productivity of crops, primarily leafy vegetables such as lettuce. Together with **Wm. Robb**, he initiated experiments with tomato, lettuce, and cucumber in 1962. By raising the CO_2 level from the normal 300-400 ppm. to 1000-2000, dry weights could be increased dramatically, provided light intensity was sufficiently high. Thus response was greater in the fall than in the winter. The principles established are still in use today, not only in greenhouses, but also in NASA's program for growing food during space travel

Forcing of Flower Bulbs. With a 5-year grant from the Dutch Flower Bulb Exporters Association of the Netherlands, the Department initiated a program on bulb physiology in August 1965. This research had two primary goals: 1) to develop a body of knowledge relative to the forcing of Dutch-grown bulbs under North American con-



Seated, left to right: R. Nederveen, Director, Dutch Bulb Exporters Association (DBEA), the Netherlands; T. A. Cowden, Dean, MSU College of Agriculture; R. Boot, Chairman, Group 1 of the DBEA; S. H. Wittwer, Associate Dean and Director of the MSU Agricultural Experiment Station. *Standing:* Gustave Springer, Director, Netherlands Flower Bulb Institute; Jan van den Hoek, Experimental Flower Bulb Forcers, the Netherlands; Frank Batschke, Batschke and Sons Greenhouses, Bay City; and A. A. De Hertogh, R. F. Stinson, and H. John Carew (Chair), all of the MSU Department of Horticulture.

ditions; and 2) to provide information readily accessible to U.S. and Canadian bulb forcers.

August A. ("Gus") De Hertogh, who came to MSU from the Boyce Thompson Institute in June 1965, and **Richard Stinson** started this program, which provided much needed information to bulb forcers.

Gus De Hertogh

Initially, the research emphasized the proper temperature regimes for forcing bulbs, including tulips, daffodils, and hyacinths. Bulbs provided by the exporters were rooted and cooled at various temperatures and periods of time to determine the best regimes for a wide range of cultivars. Based on the data obtained, guidelines were developed to permit U.S. and Canadian forcers to schedule production for maximum returns from January 1 to May 8. The information was initially published in the *Holland Bulb Forcers Handbook* in 1966. The book underwent two revisions, plus a supplement, and in 1970 was renamed the *Holland Bulb Forcers Guide*. In 1978, **De Hertogh** resigned to become Head of the Department of Horticultural Science at North Carolina State University, where he continued his flower research program until he retired in 2000.

Temperature Regimes. Royal Heins was appointed an Assistant Professor in floriculture on finishing his Ph.D. at the University of Minnesota in St. Paul in 1978. His specialty was greenhouse production of both bedding and potted plants, and he and his graduate students made a number of innovative contributions in this area. One of these was the serendipitous discovery of the concept of DIF – the effect of the difference between day and night temperatures on plant morphology. Within a limited range of temperatures, plants attain similar heights when the day temperature exceeds the night temperature by a constant number of degrees. Thus plants grown at D/N temperatures of 20/15 C resemble those grown at 25/20 C or at 15/10 C. When the day temperature is lower than the night temperature (DT<NT), plants are more compact than when day temperature exceeds night temperature (DT>NT). This method of producing compact plants reduced the need for using chemicals to control growth. A second discovery was that the rate of growth is a linear function of temperature, and that by closely monitoring growth ("graphical tracking") and adjusting temperature appropriately, plants such as Easter lilies can be programmed to be ready for sale on a given date. These two concepts have helped growers to both reduce costs and prevent losses because of unmarketable plants.

Royal Heins

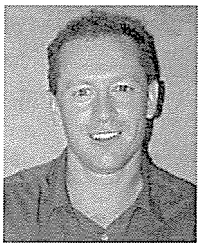
Additional experiments on herbaceous perennials, in conjunction with colleagues, including **Arthur Cameron** and **Will Carlson**, have determined the conditions (e.g., chilling, forcing temperature, photoperiod) required to force flowering of these species, thus making them more attractive as flowering plants. In the early 1990s growers contacted MSU to determine why some perennials never

Arthur Cameron

Effects of combinations of D/N temperatures on bract color in poinsettia. *Columns (NT) from left to right, and rows (DT)from top to bottom*: Temperatures at 3° intervals from 29°C to 14°C. Bracts are green in two columns at far left, red in remaining columns.

flowered until summer, even in a warm greenhouse. The growers, particularly those in the perennial and bedding plant areas, provided research grants, currently (2005) ranging from $150,000 to $300,000 annually, with individual grants of up to $40,000. In addition, some grants have been received from Japan (e.g., Sakata Seeds), Holland, and England. This has resulted in much research, primarily with garden plants, on such techniques as temperature programming, graphical tracking, and DIF. Many students and technicians have been involved, and methods of production are now available for over 500 cultivars and species.

Potted orchids have recently become the subject of a research project to determine if their flowering can be controlled by altering environmental conditions. **Heins** and his former graduate student, **Erik Runkle** (M.S. '96, Ph.D. 2000), now an Assistant Professor in the Department, began this project with GREEEN and grower support in 2000. To date they have found that flowering of some species can be promoted by short periods of long nights, followed by exposure to cool temperatures.


Erik Runkle

Nutrition. On completion of a Ph.D. with **Stanley Ries** in 1985, **John Biernbaum** focused on grower-oriented research to reduce excessive use of water and fertilizer, and thereby limit ground water contamination. There was a saying that "You could tell it was spring in Kalamazoo when the ditches ran blue" from all the fertilizer used by the greenhouse industry. Research showed that fertilizer application could be reduced markedly with little or no effect upon returns.

One of Biernbaum's students, **Mark Yelanich,** found that use of high concentrations of fertilizer resulted in more leaching, so lower rates were tested; 100 ppm of N was found to be as effective as 200-400 ppm. Growers were skeptical at first, for tradition indicated that higher rates of fertilizer were better. However, high levels reduce the pH, which can inhibit growth. For his Ph. D. thesis, Mark studied the nitrogen requirements for chrysanthemum as affected by environmental conditions. Growth – and therefore the need for water – increased with light intensity, but there was no need to increase the concentration of nitrogen.

In his Ph.D. thesis research with Biernbaum, **William Argo** looked for ways to increase the water- and nutrient-holding capacity of the media to improve nutrient use efficiency. He found that much of the fertilizer migrated to the surface with evaporation of water, both with sub- and with top- irrigation; in some cases, 40-50% of the water was lost by evaporation from the medium. Watering half as frequently, and applying extremely low amounts of fertilizer – well below anything used commercially, particularly for poinsettia – was more effective than methods then being used. This information was quickly adapted by commercial growers to reduce costs.

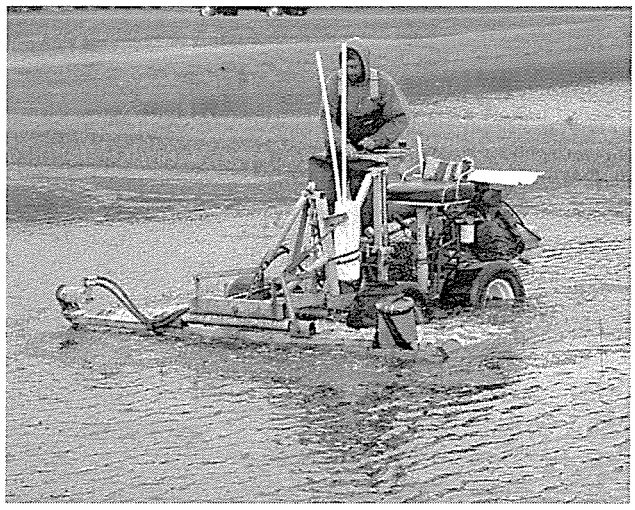

Bert Cregg

Although not related to greenhouse crops, similar work has been conducted by **Bert Cregg** on reducing leaching of nitrates in field nursery production. Bert earned a Ph.D. in Forest Resources at the University of Georgia in 1999 and joined the faculty at MSU the same year.

Small fruit

Cranberries. Cranberries have been grown in Michigan for over a century, but production was limited until the mid-1990s. In 1994, the industry consisted of one grower with 11 acres. High prices and the leadership of **Robert DeGrandchamp** of South Haven encouraged new plantings, and the acreage expanded rapidly; nine growers were farming 220 acres in 2003. (Although Michigan growers produced about 44,000 barrels in 2000, this represented less than 1% of the total U.S. crop.)

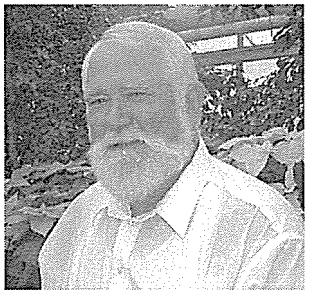
Eric Hanson tested 20 different cranberry cultivars and conducted research on methods of production at the South Western Michigan Research and Extension Center. On the basis of these studies, he recommended six cultivars for production in Michigan.


Harvesting cranberries

Viticulture and Enology. In 1889, when the College signed an agreement with T. T. Lyon for lease of his farm in South Haven (later the South Haven Experiment Station), Lyon had a collection of 87 grape cultivars, reflecting the emphasis on cultivars and their identification in the late 19th Century. However, little research was devoted to solving the cultural and physiological problems involved in grape production.

In the early 1920s, Newton L. Partridge developed a concept that he called the "growth-yield relationship" or "balanced pruning" for 'Concord' (*Vitis labrusca*) grapevines. In 1925 he wrote, "The amount of fruit produced per vine varies according to its vigor, as measured by the weight of prunings removed the winter preceding the crop, other conditions being the same," and "...under Michigan conditions, few over-vegetative vines are found. As a rule, an increase in vine growth is followed by an increased crop." In a bulletin published in 1937, Partridge recommended leaving 16 buds for the first 1/3 pound of prunings, and 16 for each additional pound. This led to the use of the "30 plus 10" system of pruning (30 buds being left for the first pound of prunings, 10 for each additional pound) in most of the *V. labrusca* vineyards in the Great Lakes region. The system appears to be as applicable to the *V. vinifera* cultivars Cabernet Sauvignon in Koonawara, Australia, Pinot noir in New Zealand and Chardonnay in the Napa Valley of California as it is to Concord in Michigan.

G. Stanley Howell's Ph.D. thesis at the University of Minnesota was a study of cold hardiness in apple. On coming to Michigan State in 1969, he continued in this area of research, studying cold hardiness in cherry, peach, and, especially, grape (see below). In addition, he developed a broad-based program covering many aspects of grape culture, and extended his interests to wine production. In 1970, Michigan wineries had a narrow spectrum of products – chiefly cold duck, muscatel, port and sweet dessert wines made from 'Niagara,' 'Delaware,' or 'Concord' grapes – all *V. labrusca* cultivars not noted for their wine quality. Howell began working with French hybrids, such as 'Seibel,' and 'Vidal,' with better wine-making potential. This involved not only enology, per se, but the cultural practices required for optimum yield and quality, especially choice of rootstock and training system, and control of vigor and crop load. Research was conducted on-campus, at several research stations, and in the vineyards of cooperating growers. He also developed a cooperative program with colleagues in New Zealand in the southern hemisphere, permitting the scientists to obtain two years' data every year.


Stan Howell

The first experimental wines were made in 1971 under the "Spartan Cellars" label. At that time the wine industry was unable to fund the activities that Howell had in mind. However, he cooperated with Michigan Senator **Robert Welborn** in writing legislation to create the Michigan Grape and Wine Industry Council, which included the Secretaries of the Michigan Department of Agriculture and of the Michigan Department of Commerce, together with the Dean of the MSU College of Agriculture and Natural Resources (CANR). Two-thirds of the amount raised from excise taxes on wine is now available for Council promotion and research activities, and CANR provides matching funds for research. Proposals are evaluated each year, and annual reports are received. This support of the Council has been invaluable in revitalizing the grape and wine industry in Michigan. Since 1970, the acreage of 'Concord' (used for juice) has declined from about 12,000 to 11,000 acres, while plantings of 'Niagara', used for white grape juice, and of wine grapes have each increased by about 1800 acres. Given the value per ton (ca. $250 for 'Concord ' vs. $650 for 'Niagara' and hybrids used for wine) this change has been very beneficial to growers.

Tom Zabadal had developed expertise in table grape production as a faculty member and Extension horticulturist at Cornell prior to becoming coordinator of South Western Michigan Research and Extension Center in Michigan in 1989. Most of his early efforts in his new position were devoted to developing the physical components of the station, including buildings, roads, and irrigation systems. He also had extension responsibilities, but has continued working with grapes, emphasizing mechanical pruning, cane positioning, vine spacing, over-wintering of cultivars with limited hardiness, and nutrition.

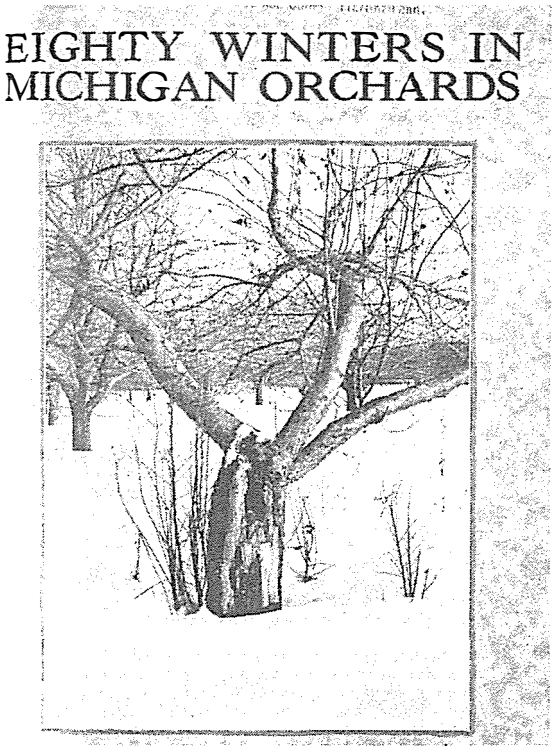
Cold Hardiness & Frost Protection

Cold injury to horticultural crops following early freezes in the fall, late freezes in the spring, or low temperatures in the winter is a perennial problem in Michigan. Peaches are especially susceptible to both bud and wood injury, as this region is the northern limit of their range, and damage often occurs to flower buds of both sweet and sour cherry. Early researchers could only observe this injury and report it so that growers could avoid planting in frost pockets and regions with little lake effect. The first planting of fruits and vegetables at the Chatham Station in the

Upper Peninsula in the early 1900s demonstrated how unsuitable this area was for these crops, as many of the plants were killed or severely injured by low temperatures.

The work of **Frederick Bradford** and **Horace Cardinell** in compiling data on conditions conducive to freeze injury (Eighty Winters in Michigan Orchards, MSC Special Bul. 149, 1926) was a first step in developing methods to reduce injury to plants that were already established. Trial plantings were helpful in weeding out the least hardy – or earliest blooming – cultivars, but little or no research was done to protect plants from injury.

Beginning in the 1970s **Stan Howell's** research provided much information on methods of preventing, or at least anticipating, injury. Hardiness was evaluated by recording injury following the freezing of twigs or



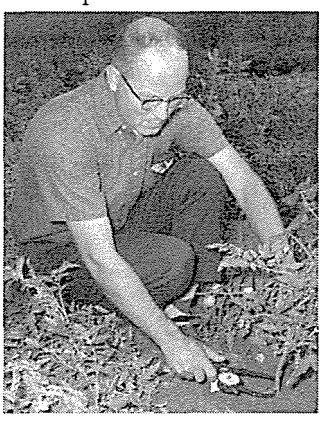
canes to selected temperatures in a programmable freezer. This revealed that hardiness of sour cherry wood and buds was reduced following premature defoliation by cherry leaf spot when fungicide applications were discontinued following harvest. Subsequent work with peach and grape evaluated hardiness throughout the dormant period, and permitted prediction of hardiness levels as affected by both cultivar and cultural practices. A double-trunk system for grapes was introduced as a way to compensate for cold injury. When only one trunk is damaged, the other can be used to replace it. Leaving canes long in pruning delays bud break at lower nodes; the canes can be pruned back after the danger of freezes has diminished.

Several tests of freeze-fighting equipment have been made by Agricultural Engineers, with cooperation from Horticulture faculty. **Frank Dennis** cooperated with agricultural engineer **Clarence Hansen** in testing a jet engine-driven fan ("RamJet") in a commercial orchard near Leslie. The jet engine provided heat and powered the fan, which mixed the cold and warm air. This proved ineffective, in that the heat was generated too high above the ground to have an appreciable effect upon temperature at ground level. Furthermore, the noise was deafening.

In the 1980s Dennis, in cooperation with several district horticulture agents, evaluated freeze injury to cherry buds in several commercial orchards, using max/min thermometers to record temperatures in frost pockets and on the level. This permitted prediction of injurious temperatures during bud opening in the spring. Subsequent work with overhead sprinklers in several orchards and vineyards evaluated response to evaporative cooling to delay bloom, which had been very effective in the arid climate of Utah. Given Michigan's humid climate, the delay was only one or two days, making the method uneconomical. Several chemicals were tested for delaying bloom. Ethephon was effective on peach and plum when applied in the fall, but injury and gummosis were excessive, and many buds failed to open. Aminoethoxyvinyl glycine (AVG), later marketed as Retain© and currently used to delay preharvest drop of apple, did not delay bloom, but increased fruit set in apple.

Mechanical Harvesting

Harvesting Pickles and Tomatoes. Stanley Ries became a member of the Department on completing a Ph.D. at Cornell in 1953. His assignment was 50% extension, with emphasis on processing crops, and he worked with growers on cultural practices for cucumbers, in which yields were low – 50 to 90 bu./A. Experiments with closer plantings achieved yields up to 200-300 bu./A, but fruit set of available cultvars was limited to one or two fruits per (multiple) harvest, making hand harvest expensive.


Stan Ries

In the early 1960s, **William Stout** in Agricultural Engineering worked with

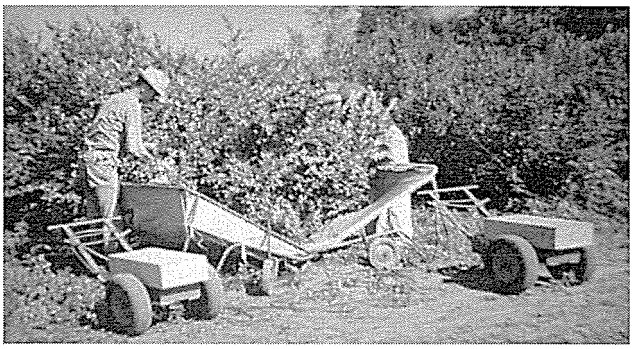
Pickle harvester

Ries to develop a machine for multiple harvesting of cucumbers. Several different systems for removing fruit were tested, beginning with a machine that the H. J. Heinz Co. had developed. The industry was supportive and provided funds, but **Stout** and **Ries** failed to come up with an effective harvester. Stout calculated that, even if the machine were acceptable, the costs would be excessive because it could harvest only a small acreage. A machine was needed for once-over harvest of 100-200 acres, and data indicated (see above) that close spacing gave high yield. Therefore a new machine was built and Stout and Ries developed cultural methods for once-over harvest. The principle used in mechanical harvesting was to squeeze the fruits off the plant. As indicatd above, available cultivars set few fruit, and one was needed that set many. **Clinton Peterson** used a gynoecious cucumber, which produces only female flowers, as a base to develop a commercial type that sets many fruits at a time, thus allowing once-over harvest. He also developed methods for producing hybrid seed, which resulted in the 1960 release of the first F_1 hybrid pickling cucumber, 'Spartan Dawn.' The genetic material and techniques have been widely adopted by breeders elsewhere. (See also section on breeding.)

Clinton Peterson in the greenhouse.

Harvesting Asparagus. John Downes and **Richard Dedolph** also worked with Stout and the Friday Tractor Company in the mid-1960s to develop a machine to harvest asparagus. Despite much effort, the work was unsuccessful. Because the shoots develop continuously, the tips of many of them were removed prematurely, retarding their growth. Although application of auxins and benzyladenine stimulated their growth, the stems were distorted and yields were low.

Harvesting Blueberries and Cherries. Jordan Levin, leader of the USDA unit on mechanizing horticultural practices in Agricultural Engineering, together with **Harold Gaston** in Horticulture, began working on harvesting these crops mechanically in the mid 1950s. Hand vibrators were first used on blueberries, the fruits falling into simple catching frames. Subsequently over-the-row harvesters were developed that "slapped" the canes to remove the fruit, which fell into conveyors that carried them to small bins.



Harvesting blueberries with a vibrator.

Blueberry harvester.

Limb shakers were used to remove cherry fruits, which fell on canvas frames, rolled down to a conveyor, and were conveyed to tanks containing cold water (sour cherry) or to large bins (sweet cherry). These systems are used for most of Michigan's cherries today, except that trunk shakers have replaced limb shakers. See also work on fruit "loosening" of cherries (Ch. 2).

"Soft cherries" (sour cherry fruits so soft that they will not roll following mechanical harvest) are a problem for both growers and processors. A series of studies was made to find the cause – and the remedy. In cooperation with **Galen Brown and Edward Timm** of the USDA/MSU Agricultural Engineering team, **Frank Dennis** and graduate student **Mario Mandujano** used a computer-operated force gauge to measure fruit firmness during fruit ripening in orchards where the problem had occurred in previous years. As expected, fruit softened as ripening progressed, but no further change in firmness occurred when harvest was delayed beyond the time of optimum maturity. Several treatments were tested to increase fruit firmness, but none was successful. A "splat test" – dropping the fruits from a height onto a firm surface – was evaluated, and recommendations were made to growers on suitable materials for covering catching frames.

James Flore, Wayne Loescher, Steve van Nocker and their students are currently exploring the roles of pectins, enzymes, and minor elements, especially boron, in fruit softening, as well as those of genes that regulate ripening, but the problem has not been solved at this writing.

Harvest Maturity

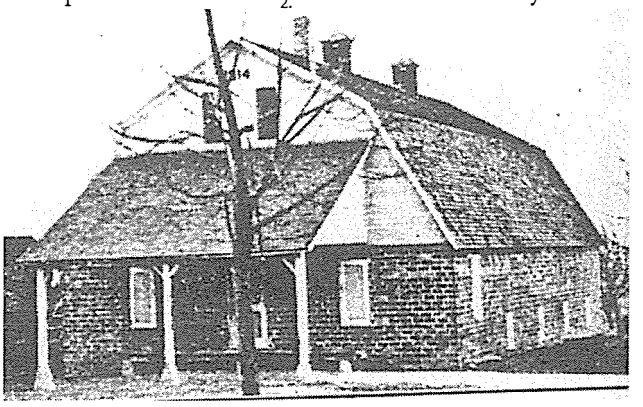
Determining Optimum Time for Harvesting Apples. In 1923 a team of MAC professors and USDA scientists initiated a program to determine optimum time of harvest for various apple cultivars. In 1957 an apple maturity committee was organized by growers, packers, and extension agents in Southwest Michigan, together with MSU faculty, with the primary purpose of preventing immature fruit from being marketed. In 1961, **Donald Dewey** and **David Dilley** began studies to predict optimum time of harvest based on rates of respiration, and a prediction service for 'McIntosh' and 'Jonathan' was available beginning in 1965. In the 1970s Dilley introduced such a system based on the rate of ethylene evolution by the fruits. As a part of the research, Dilley and associates developed and marketed a modified smoke detector ("Snoopy") for measuring ethylene, so that growers could evaluate maturity under field conditions.

Post-harvest Storage Methods. Little progress was made in apple storage technology prior to 1920. Apples were commonly stored loose in piles covered with straw to prevent freezing during the winter. Later the common or air-cooled storage became popular. The fruits were kept in insulated wooden buildings with vented roofs and doors on the sides. The doors were opened at night to allow cold air to enter and displace the warmer air, which escaped though the vents in the roof. In the morning the doors were closed, and the cycle was repeated daily.

"Snoopy" – a device for measuring ethylene content of fruit under field conditons.

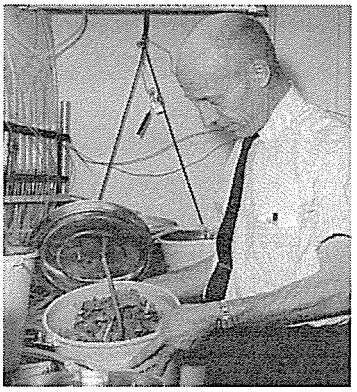
The first Michigan storage with this construction was built on the **Henry Kraft** farm near Sparta, and still stands today. It was constructed of 4-in. hollow tile with camel's hair blankets between the walls for insulation. In the late 1920s and early '30s, **Roy Marshall** determined rates of air flow through such storages in response to varying the size and locations of the air vents, and developed recommendations for their construction and operation.

Mechanical refrigeration equipment was later introduced, making air-cooled systems obsolete. However, apples could be stored for only four to six months and still retain sufficient firmness to be marketable. The controlled atmosphere (CA) method of storing apples was introduced in Michigan by Dewey in 1955. Apples were stored in air-tight, sealed rooms; respiration by the fruits lowered the oxygen level and raised the CO_2 level, thereby limiting the rate of respiration and prolonging storage life. Once the appropriate levels of O_2 and CO_2 were attained, they were regulated by ventilation and by absorption of excess CO_2 either with lime or by water.


Kraft Storage, 1939.

In 1956, based on Dewey's recommendations, commercial CA storage rooms were constructed on the farms of apple growers **Erwin Klenk, William Schaefer, and Vernon Bull.** Dewey and **I. J. Pflug** of the Agricul-

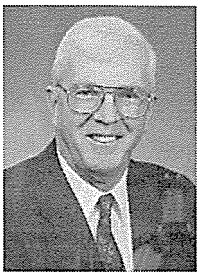
tural Engineering Department determined the conditions, equipment and facilities needed to regulate the O_2 level to 2-3% and the CO_2 to 5-6%. The capacity of Michigan CA storages was 157,000 bushels in 1957, and increased rapidly, reaching 665,000 in 1959 and 3,500,000 in 1970. Today approximately one-half of the Michigan apples used for fresh consumption are stored in CA and can be marketed until the following summer. In addition, in 1960 **Dewey** and **Pflug** developed a water submergence dumper for transferring apples from bulk bins to the packing line.



Dewey measuring respiration rate of vegetables.

Pflug and Dewey examining fruits in storage.

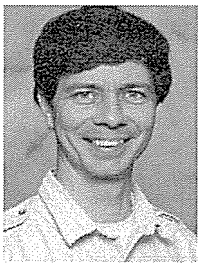
Dependence on fruit respiration for maintaining O_2 level was discontinued when propane burners were introduced to "burn off" excess oxygen in CA storages, thereby reducing the time required to bring the oxygen concentration down to the desired level. In several cases, the propane ignited, destroying storages and injuring personnel. This had occurred in a Michigan storage in 1981, leading **David Dilley** to search for a better method of controlling the oxygen level.



David Dilley

While on sabbatical leave at the Imperial College of Chemistry in London, Dilley spent several months in the British Patent Office reviewing the techniques used for separating oxygen from nitrogen in air. He found two ideas with potential. One, a microporous carbon molecular sieve that could separate oxygen and nitrogen, was beginning to be used for health care and industrial applications. The other, using hollow fiber membranes, was being developed by Monsanto and Dow chemical companies. On his return to MSU, Dilley, with support from Monsanto, installed a molecular sieve system at the Clarksville Experiment Station in the fall of 1986. The system was so successful that most CA storages now use it. It has revolutionized the storage of apples world-wide.

Studies by **Randy Beaudry** and others demonstrated that exposure of apple fruits to 1-methylcyclopropene (1-MCP), a gaseous plant growth regulator, completely inhibited the fruits' production of ethylene and several other volatiles. They could be stored at room temperature for up to 30-40 days. Although aroma was reduced, it eventually returned to the original level. This chemical is now being used commercially to prolong storage life of apples.



Randy Beaudry

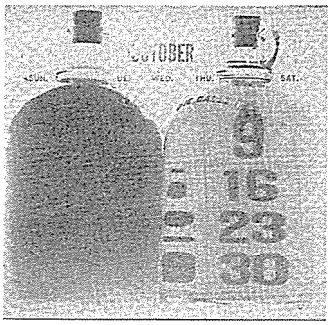
Tomato Fruit Ripening. **Robert Herner** conducted experiments with two tomato genotypes with unusual ripening behaviors. One, designated RIN for ripening inhibitor, does not ripen, although the color changes from green to yellow. It proved to be a single-gene mutant that is non-climacteric and therefore unable to ripen normally. Treatment with neither ethylene nor 2-(4-chlorophenylthio)-trimethylamine (CPTA) induced ripening. However, ethylene application changed the color from green to yellow, and CPTA induced the formation of the red pigment, lycopene, indicating that lycopene synthesis was independent of ethylene production.

Robert Herner

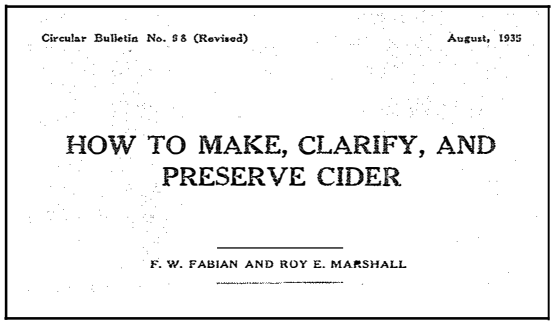
Processing and Packaging. In addition to research on production and storage of horticultural products, faculty members have also worked on projects dealing with processing and packaging. Beginning in 1915, during **Eustace's** chairmanship, experiments were conducted on freezing fruits and vegetables at 15°-20°F. Success was obtained with (sour ?) cherry, gooseberry and raspberry, but not with strawberry, sweet cherry, asparagus and large fruits. Little mention was made of additional experiments in subsequent annual reports. In 1922, the extension staff reported "great interest in fruit processing paralleling the financial success" of commercial canners. In 1933, during the Depression, home canning became popular, increasing interest in home gardens and the demand for small fruits.

In addition to his work on apple storage, **Roy Marshall** was instrumental in developing methods of fruit and vegetable dehydration, processing of cherries, and blanching of vegetables. One of his most important contributions was perfecting a method for clarifying apple juice, making the product much more desirable to consumers. **Z. I. Kertesz** at Cornell University had developed an enzymatic technique for clarifying apple juice. Treatment with an enzyme produced by the mold *Penicillium glaucum* caused flocculation of colloidal material, which could be removed by filtration. However, the project was subsequently discontinued. Marshall,

together with **F. W. Fabian** in bacteriology, continued this research, beginning in the early 1930s, and perfected the method to produce a cider of superior flavor that would keep indefinitely during storage, making the product much more desirable to consumers. The Michigan State Canners Association worked with them and commercialized the product. Within a few years, half of Michigan's cider was preserved by this means.



Processed cider. *left*: not clarified; *right*: clarified. Calendar numbers can be seen through glass jug.


Circular Bulletin No. 88 (Revised) August, 1935

HOW TO MAKE, CLARIFY, AND PRESERVE CIDER

F. W. FABIAN AND ROY E. MARSHALL

Marketing

Fresh Apple Slices. Beginning in 2002, Project GREEEN funded an interdepartmental project to explore the marketing of fresh-sliced apples. Whole apple fruits are less desirable as snack foods than are slices, but exposure of apple flesh to air leads to oxidative browning. **Randy Beaudry** worked on this problem with colleagues in both Agricultural Economics and Food Science and Human Nutrition, concentrating on evaluation of packaging, including the plastic container used, and use of anti-oxidants to reduce browning of the tissue. Six cultivars were evaluated – Empire, Jonathan, Honeycrisp, Jonagold, Golden Delicious, and Fuji. The first three proved to be most adaptable. As a result of this research, a Michigan processor now supplies the product to McDonald's restaurants, and demand is expected to increase.

Chestnuts. Bridget Behe came to MSU from Auburn University in 1997. She has cooperated with colleagues in other departments in trying to change agriculture's production-business paradigm by doing market research to proactively establish markets and build demand before supplies peak. Chestnuts were popular with U.S. consumers until the early 20th Century, when the chestnut blight killed essentially all the native trees. Michigan growers have since planted many chestnut trees resistant to the blight without having established a market. One of the researchers' goals is to find ways of using chestnut products before the trees come into production. They have supplied nuts to professional chefs to make purees for evaluation, and have introduced a mechanical sheller from Italy, which reduces the high cost of shelling.


Bridget Behe

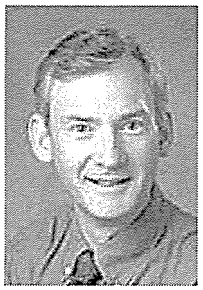
Edible Flowers. Graduate student **Kathy Kelley,** working with Behe and **John Biernbaum**, studied the marketing of edible flowers, such as nasturtium. She test-marketed edible flower mixes at supermarkets, and evaluated response to color, composition, price, and taste to determine customer preferences. Results indicated that consumers preferred mixtures of flower species over single species.

Carrots. In Michigan, carrots have traditionally been marketed in 3- to 5-lb. bags, but few families consume this many carrots in a reasonable time. In addition, the carrots have to be washed, peeled and cut. California growers control 98% of the market in the small, sweeter carrots, and are also taking the long carrots, cutting them into smaller pieces, and packaging them as baby carrots. (See section on carrot breeding in Ch. 2.) Until Michigan growers can find a way to produce small, sweet carrots, they can't compete with California. Behe and her collaborators are testing new ways of making carrots more appealing – dipping them in ranch dressing, for example.

To increase growers' income, Behe suggests using the cull carrots, currently used by hunters to lure deer, in purees and pasta sauce for school lunches. Or they might be grown organically in hoop houses off-season, where they reportedly are sweeter.

Sweet and Sour Cherries for the Fresh Market. Over 90% of Michigan sweet cherries are processed, whereas many of those produced in Washington, Oregon, and California are sold fresh at much higher prices. Several obstacles to production for fresh market are: (1) the labor costs of hand-harvesting these small fruits from large trees; (2) the risk of rain cracking, wind damage, and fungal disease in Michigan's variable climate; and (3) problems with consistent yields of high quality fruit, given the smaller size of standard Michigan cultivars and traditional orchard management techniques designed for producing fruit for processing.

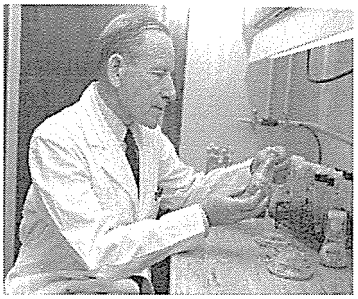
Greg Lang, along with wife **Suzanne,** moved to MSU from Washington State University, Prosser, in 2000. He is evaluating larger-fruited sweet cherry cultivars for fresh market sales, new dwarfing rootstocks for improved labor efficiency, and more intensive, yet simplified orchard


Greg Lang

management techniques, with the aim of increasing returns to the grower. The research has included fundamental physiological studies and computer modeling of cherry cropping on dwarfing rootstocks, market segmentation studies to determine in which markets Michigan growers can compete successfully, consumer taste tests to compare Michigan cherries with those from the Pacific Northwest, and market acceptance of new categories of cherries, including "sweet-tart" cherries like the cultivars from Hungary – Balaton, Danube, and Jubileum – recently released by MSU. (See information on cherry breeding in Ch. 2.)

Food Quality/Human Health

E. **H. Lucas** tested extracts from a wide range of plants, including garlic, onion, and coffee, for antibiotic activity and/or effectiveness in retarding the growth of mammalian tumors. Beginning in 1944, he screened more than 2000 plants, some chosen on the basis of folklore. Lucas and chemistry professor **Richard** U. **Byerrum** found a compound with promise, named calvacin, in the giant puffball (*Calvatia gigantea*). **Everett S. Beneke** of the MSU Botany Department, and several commercial laboratories, including Armour and Co. and the Sloan-Kettering Institute for Cancer Research, cooperated in refining and testing this compound. Beneke and Byerrum, with the support of grants from the National Institutes of Health, continued their study of calvacin after Lucas's untimely death in 1959, but the effects were insufficient for commercial application.


E. H. Lucas in laboratory.

Lucas also conducted a test to determine the truth of the maxim "an apple a day keeps the doctor away." With the financial support of the National Apple Institute and the cooperation of the campus medical center, he provided apples to more than 400 students who volunteered to eat three apples a day for two academic quarters. The experiment was repeated for 3 years beginning in October 1956, and the medical records of the volunteers were compared with those of the student body as a whole. An article on the project, published in *Life* magazine (March 24, 1958), began, "This white-coated man, looking like a large-scale fruit vendor, is ... engaged in what is probably the most pleasant medical experiment in the country."

Lucas died prior to completing the study, but the results were analyzed and published by **Richard DeDolph**, et al. in the *Michigan Quarterly Bulletin* [Vol. 44(2), November 1961]. The conclusion? "The health of the apple-eating volunteers was... generally better than that of the student body as a whole, as indexed by clinic calls made during the experimental periods" (p. 6).

Antioxidants. As plant extracts for dietary supplements and health food became an issue in the 1990s, **Muralee Nair** began research on human health, especially products for preventing type I and type II diabetes, cancer, cardiovascular diseases, and inflammation. He read an anecdotal report on the beneficial effects of tart cherry juice in reducing heart attacks and several other ailments, and obtained funding from the Michigan Cherry Marketing Institute to follow up on these observations. Preliminary data had indicated that cherry anthocyanins, like pain killers, inhibited the activity of enzymes involved in inflammation. Together with colleagues in Food Science and Human Nutrition, Nair analyzed compounds in fruit of both 'Balaton' and 'Montmorency' cherries, quantified them, and evaluated them for antioxidant activity and for inhibitors of the cyclooxygenase enzymes COX-1 and -2.

Cherry anthocyanins were ten times as effective as aspirin in inhibiting both enzymes, and had potential for preventing colon and other forms of cancer. The team obtained a series of patents for using these compounds from tart cherry for pain relief, and growers are now selling cherry concentrate at high prices. The group is currently attempting to determine the mechanisms of action.

Nair and **Robert Schutzki** are evaluating edible fruits of ornamental plants as sources of antioxidants. For example, fruits of several dogwood (*Cornus*) species are consumed in Europe, but not here. This could be a new crop for Michigan farmers. Other projects include effects of natural products in treating diabetes and cancer, as well as controlling nematodes and mosquitoes.

Environmental Protection

Phytoremediation. The use of plants to remove pollutants, termed phytoremediation, has potential for reducing the levels of agricultural chemicals from both soil and water. **Tom Fernandez** (Ph.D. '92) is determining the effectiveness of this procedure to reduce the levels of herbicides in run-off water from nursery beds. Preliminary results indicate that several semi-aquat-


Tom Fernandez

ic species are capable of removal of up to 30 to 40% of nitrates or herbicides (separate experiments) from the water.

Greenroofs. As urban development replaces forests and agricultural lands with impervious surfaces, recovery of green space becomes increasingly critical for the health of the environment as well as for human well-being. Covering roofs with vegetation is one potential remedy for this problem. The plants keep buildings cooler in the summer, reduce runoff, and prolong the life of roofing materials by protecting them from UV radiation, extreme temperatures, and rapid changes in temperature. They also improve the aesthetics of urban environments and provide habitats for birds and other organisms.

The green roof research program at MSU was initiated in 2000. **Brad Rowe**, who completed a Ph.D. at North Carolina State University in 1996, led the research team, with collaborators in six other Departments. The team advised the Ford Motor Company on the design and installation of the world's largest (10.4 acres) green roof, installed in 2000 on a new assembly plant in Dearborn, Mich. Similar experiments are being conducted on roof platforms at the Horticulture Teaching and Research Center, in the Plant Science Greenhouses, on the roof of the Plant and Soil Sciences Building (installed May 2004), and on the Communication Arts Building (installed May 2005). Objectives include evaluation of (a) plant species and (b) the effects on stormwater runoff, water quality, energy consumption and other factors.


Brad Rowe

Integrated Crop Management. On completion of a Ph.D. in weed science at Laval University in Quebec, **Mathieu Ngouajio** joined the Department as an assistant professor in 2001. He is developing integrated crop management strategies for several vegetable crops, with emphasis on control of weeds, diseases, and insect and nematode pests. He has observed that certain cover crops can reduce weed competition in subsequent crops, an example of allelopathy. Experiments on the use of plastic mulches are also underway.


Mathieu Ngouajio

Cropping Systems. After working with international agencies in Zimbabwe and Malawi, **Sieglinde Snapp** accepted a joint appointment in the Departments of Horticulture and of Crop and Soil Sciences in 1999. Her goals are to improve and conserve soil quality while maintaining profitability in producing vegetables, including potatoes. Practices under study include use of farm manure and winter cover crops to reduce the need for fumigants and commercial fertilizers. Snapp and cooperators, with funding by Project GREEEN, are determining if cover crops can suppress nematode populations, fungal growth, and disease symptoms in subsequent crops.


Installing green roof at PSSB.


Installed green roof.


Sieglinde Snapp

CHAPTER 4

FIELD RESEARCH - RESEARCH STATIONS

1. UPPER PENINSULA EXPERIMENT STATION (1262 ACRES)

Chatham Station, in Michigan's Upper Peninsula (see map), was established in 1899 when 160 acres of land were donated to MAC by the Munising Railway Co. Ten years later the Cleveland Cliffs Iron Co. donated an additional 630 acres.

The first superintendent was **Leo M. Geismar**, who served from 1900 to 1912. Work with farm crops, including potatoes and other vegetables, and cereal grains, began in 1902. All work with animals except cattle was discontinued in 1982. Today the station consists of 1262 acres and serves as the hub of beef and dairy research in Northern Michigan.

A. F. Yeager was stationed briefly at Chatham in 1937-39, and released a tomato cultivar with enhanced fruit set, Victor, which was named an All-American selection in 1941. Yeager moved to New Hampshire in 1939, where he continued his breeding work with both tomatoes and lilacs. There he served as chair of the Horticulture Department and was elected president of the American Society for Horticultural Science, as well as a member of the American Academy of Arts and Sciences.

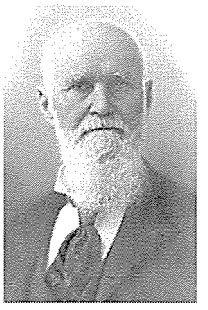

A.F. Yeager

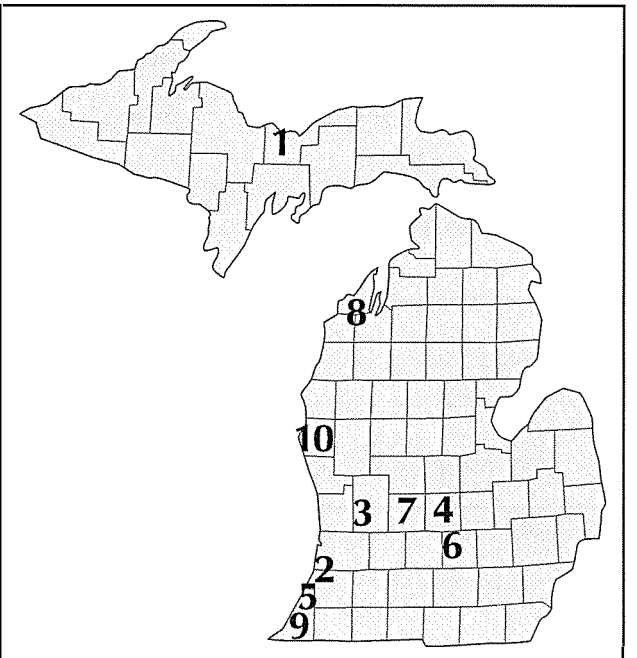
Robert Carlson conducted experiments with vegetables and fruits, including plums, at Chatham during two summers on first arriving at MSC in 1946. Most of the research involved weed control, especially the use of herbicides such as IPC on quackgrass, and the first use of 2,4-D on strawberries.

Horticultural research at the Station continued into the 1980s; **Bernard Zandstra** maintained research plots for vegetable cultivar evaluation there from 1977 until 1982, and continued to advise local growers until 1995.

2. SOUTH HAVEN EXPERIMENT STATION (100 ACRES)

One of the early supporters of the College was **Theodatus Timothy Lyon**, a native of New York. While still a boy, he had moved to Michigan with his parents in 1828. He operated a farm and sawmill at Plymouth, and there established a test orchard for apple and pear cultivars, scions of which he obtained from many sources. He became an authority on cultivar identification, noting that the same cultivar was often known by several names. He provided scions of many cultivars to the College for use in establishing orchards at East Lansing.


Theodatus T. Lyon



Map Showing Agricultural Experiment Stations in Michigan

Currently there are 15 agricultural experiment stations in Michigan. Those with horticultural programs and some additonal ones no longer in use, are described in order of time of establishment.

1. Upper Peninsula Experiment Station
2. South Haven Experiment Station
3. Graham Experiment Station
4. Muck Soils Research Farm
5. Sodus Experiment Station
6. Horticulture Teaching and Research Center
7. Clarksville Horticultural Experiment Station (CHES)
8. Northwest Michigan Horticultural Research Station
9. Southwest Michigan Research and Extension Center (SWMREC)
10. Oceana County Asparagus Industry Research Farm

In 1874 **Lyon** moved to South Haven and established a new orchard and nursery. However, he was less a commercial farmer than a scientist and author; he served as president of the Michigan Pomological Society (later the Michigan State Horticultural Society) from 1876 to 1893, and edited the American Pomological Society's (APS) fruit variety catalogue for more than 40 years. Displays of his fruits at fairs and expositions also made him well known among pomologists, and he was awarded an honorary Master of Horticulture degree by the College in 1891.

The Hatch Act of 1887 provided for the establishment of State Agricultural Experiment Stations. Lansing was not highly regarded as a site for fruit because of the frost hazard, and Lyon argued for establishing such a station on the shore of Lake Michigan. He had retired from the nursery business in 1885, and in 1888 signed an agreement with the Board of Agriculture to write a report (Bulletin No.55) on the cultivars under test in his orchard. His collection at that time included 40 cultivars of apple, 37 of pear, 38 of peach, 27 of cherry, 17 of plum, and 87 of grape, with smaller numbers of quince, apricot, chestnut, pecan, English walnut, mulberry, and brambles. This led to the Board's leasing the orchard in 1889, retaining Lyon as superintendent. Citizens of South Haven contributed an adjacent 5 acres of land to provide a permanent sub-station, and Lyon continued in his supervisory role until his resignation in 1898 at the age of 81.

Lyons' property (7.9 acres in South Haven), buildings and library were left to the Michigan State Horticultural Society on his death in 1900. Additional parcels were purchased between 1931 and 1956 to provide a total of more than 100 acres of land for breeding stock and seedlings of apple, pear, peach, blueberry, strawberry, and apricot.

T. A. **Farrand** served as director of the Station in 1900; on his untimely death in 1908, T. A. **Wilkin** became director. I. R. **Noteware** served from 1915 until **Stanley Johnston** became superintendent in 1920. In addition to comparison of cultivars, various chemicals were tested for disease control at South Haven in the early years by L. R. **Taft.** The main emphasis was always breeding and variety testing, with peach as primary subject and lesser emphasis, in decreasing order, on blueberry, apricot, strawberry, raspberry and pear. However, as noted above, the fame of the Station rests upon the Haven peaches introduced by Stanley Johnston.

In 1967, his first year at MSU, **Robert Andersen** was appointed to succeed Johnston as superintendent and fruit breeder, and worked with him and **James Moulton** at South Haven. Johnston died in 1969, and Andersen and Moulton continued the breeding program, releasing several peach, apricot and blueberry cultivars from crosses made by Johnston. The program was moved to Clarksville when the South Haven station was closed in 1980.

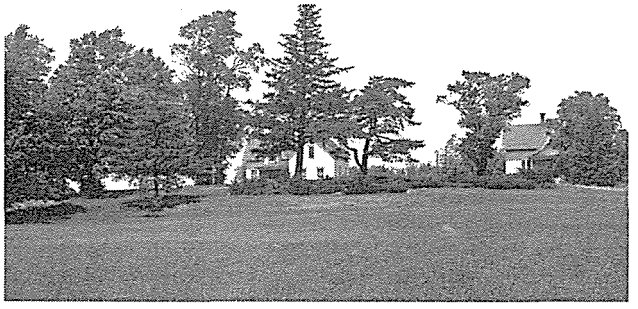
3. The Graham Experiment Station (100 Acres)

In 1917 **Robert D. Graham** gave Michigan Agricultural College his 50-acre farm near Grand Rapids so that fruit research could be conducted in the heart of the fruit growing area of west central Michigan. Mr. Graham was chairman of the Michigan State Board of Agriculture at the time, and had a strong interest in the Michigan fruit industry. This property became the Graham Station. Two years later, the College bought from Mr. Graham an additional 50 acres adjoining the original parcel. L. F. **Wade**, the first superintendent, planted the first apple trees in 1919. **H. D. Hootman** replaced Wade in March 1920, and planted the first tart and sweet cherries, pears, and plums. Peaches were added in 1921. The large house on the property was split in two, and one half was moved to the west to provide housing for the superintendent and an employee, respectively.


Robert Graham

H. G. Wells was appointed superintendent in 1924 when Hootman became Extension Fruit Specialist for the College. Although it was primarily a fruit station, an arboretum was initiated in 1925, and 130 selections of lilac and California privet were planted to test their adaptability to the area. This drew 250 visitors for Landscape Day in 1932.

Walter Toenjes (M.S. '28) succeeded Wells and remained Superintendent for 32 years (1930-62). In addition to his responsibilities in carrying out field experiments for faculty members at E. Lansing, he also conducted experiments that he designed. **John Gilmore** ('61; M.S. '62), born and raised on a cherry farm in



The Graham Experiment Station

Michigan State Horticultural Society meeting at the Graham Station about 1920

Grand Traverse County, became superintendent when Toenjes retired. When the Graham Station was closed, **John** became responsible for the orchard operations at the new Clarksville Station (see below).

Research projects were designed to improve cultural practices, especially soil management, test new fruit varieties and rootstocks, provide a basis for recommendations for pest control for all tree fruits, and test chemicals for fruit thinning and for control of pre-harvest drop in apple and pear. Experiments performed here by **Arthur Mitchell** and others were the basis of the fruit spray calendar issued annually by the Departments of Horticulture, Botany/Plant Pathology, and Entomology. By the mid-1960s the Station had become surrounded by the expanding city of Grand Rapids, limiting ability to conduct research, burn brush, and use pesticides. Land for the Clarksville Horticultural Research Station (see below) was purchased in 1974, and operations at the Graham Station were gradually phased out beginning in 1983, as the orchards at Clarksville became usable for research. In 1987 the Station was closed and the land was sold.

The Graham Station Arboretum

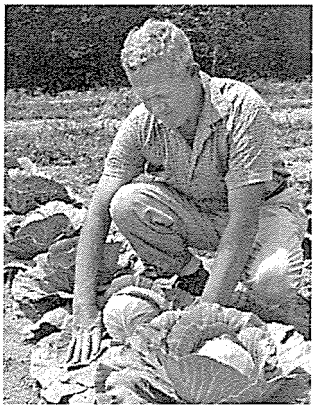
4. Muck Soils Research Farm (320 Acres)

In 1858 the State of Michigan granted to the Michigan Agricultural College 6799 acres of unoccupied swamp in the townships of Lansing, Meridian, DeWitt, and Bath. Most of this was sold, the primary purchaser being U.S. Senator **Zachariah Chandler**, who owned 3160 acres in 1869-71. From 1900 to 1930, most research on organic soils was conducted on farmers' fields. As of 1941 the College retained over 200 acres of undeveloped organic soil in the Corey Marsh near Bath in Clinton County, but did not use it. Only 14 acres of such soil on Mt. Hope Rd. were being used for research. The efforts of the Michigan Muck Farmers Association led to the State Board of Agriculture granting $5000 in 1941 to start a new 200-acre muck farm for experimental use on the original tract in the Corey Marsh. An additional 120 acres, including 80 acres of organic soil, were purchased in 1956, making a total of 320 acres. This area is currently used primarily for vegetable research by faculty in the Departments of Horticulture, Crop and Soil Science, Entomology, and Plant Pathology. Projects include studies of weed, insect and disease control, cultivar evaluations, tillage, crop rotation, sub-irrigation, nutrient management, and late blight of potato. Crops other than potato being researched are carrots, celery, onions, sweet corn, radishes and lettuce.

5. Sodus Experiment Station (50 acres)

At the urging of the Southwestern Michigan Growers Association, the Horticulture Department developed a 60-acre farm in the southwestern part of the state near Sodus in 1955, the year that Michigan State College celebrated its centennial and became Michigan State University. This farm, named the Sodus Experiment Station, was intended for research with vegetables, grapes, and other small fruits grown in that area. The loamy-sand soil is typical of those in the major vegetable production regions in southwest Michigan; water for irrigation was pumped from the St. Joseph River. The land was leased (5-year renewable lease) to the Southwest Growers Association at an annual cost of $1 by the Indiana-Michigan Electric Company. The Board of Directors of the Association oversaw the purchase and

maintenance of the buildings and equipment, and the Michigan Agricultural Experiment Station provided supervisory personnel, a farm manager, and a faculty coordinator. Funds for the operation were provided jointly by the Association and the Experiment Station. The first faculty coordinator of research for the Station was **R. L. Carolus**; he was succeeded by **John Downes** (1955-69) and **Hugh Price** (1971-88).


John Downes with cabbage

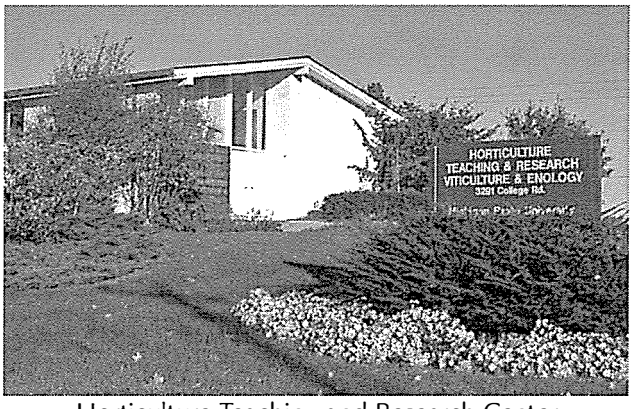
Main emphasis was on evaluation of a wide range of fresh market vegetables, including asparagus, broccoli, cucumbers, tomatoes, peppers, and sweet corn; tests were also conducted with strawberries and wine grapes. Scientists from the Departments of Entomology and Plant Pathology also had research projects here.

Operations at the Sodus Station were transferred to the Southwest Michigan Research and Extension Center when it came on line in 1988.

6. Horticulture Teaching and Research Center at E. Lansing (220 acres)

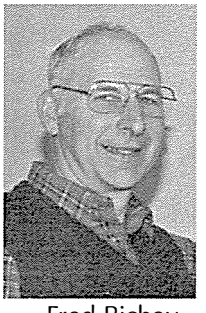
A 30-acre tract of land bordered by the Grand Trunk railway on the north, Baker woodlot on the west, and Hagadorn Rd. on the east was turned over to Horticulture in 1925. This may have been given to the Department to compensate for its loss of outdoor instructional facilities to new building construction on campus. An additional 20 acres of land to the west, previously used by Crop Science, were added in 1956.

Buildings on the farm in the 1950s included a large barn, in which crates were stored. Just east of the barn was a large root cellar about 40' X 40'. On the east side of the farm, along Hagadorn Rd., were a nursery and a blueberry patch. On the north side of Service Rd. a metal quonset barn housed tractors, field equipment and other tools, and a shed was used for storage of sprayers. Some grapes and tart cherry trees were planted just east of the spray shed. An apple orchard was established to the south and west of the barn, including an experimental block of trees on Malling rootstocks. A small controlled atmosphere storage was constructed in the mid-1950s and used to evaluate a Tectrol® generator for CA storage of apples.



Horticulture Teaching and Research Center

In 1958 **Olin Brown**, foreman of the Horticulture Farm since 1929, resigned and **Fred Richey** ('53), who had worked on the farm since 1953, was appointed in his place.


Fred Richey

Plans to build a medical school necessitated abandoning this research farm. Approximately 110 acres of land on the west side of College Rd. (Biebersheimer Farm) south of Jolly Rd., including 10 acres of woods, were purchased in 1963, and an additional 72 acres were added on the east side of the road in 1967. The University appropriated $224,000 for development of the area, and Richey was responsible for much of the work.

The existing buildings, together with fences, trees, and tree rows, were removed and the land was plowed. Trenches were dug in December of 1964 for installation of irrigation pipes, despite the presence of considerable snow on the ground. In 1965 apple, peach, plum, and apricot trees were planted, a 12-in. well 372 ft. deep was drilled, and land clearance and construction of new buildings were completed. In 1964-65 a fruit storage building, with four refrigerated storage rooms equipped to conduct CA storage

M. Polock, Wm. Chase and G. Winchell

experiments and a small laboratory in the basement, was added, with the manager's office and a student apartment above. A larger (78 X 84 ft.) building housed a large room for equipment repair and seven refrigerated storages for nursery stock, seeds, herbaceous plant material, and vegetables. A pole barn for storage of equipment and supplies completed the complex. A second, smaller pole barn was added near the woodlot in 1967. The new complex was dedicated during an open house on August 2, 1967. Initially, personnel included **Richey,** Manager, **Archie Carpenter,** Amos **Lockwood,** and **Cecil Yoder.** **William Chase** (M.S. '90) became manager on Richey's retirement in 1990. Chase and **Gary Winchell** comprise the staff in 2005, **Marshall (Lou) Polock** having reetired in 2003.

The Michigan Grape and Wine Industry Council (MGWIC), organized in 1985, began funding research by **Stan Howell** and others, and helped cover the cost of a new wine production facility at the Horticulture Teaching and Research Center in 1988. A pole barn for storage of pesticides was later added.

Plastic greenhouses. After Horticulture moved to the new building in 1986, Botany/Plant Pathology occupied the greenhouses, constructed in the 1920s, adjacent to the Old Horticulture Building. **John** Mugg, greenhouse manager, made extensive changes in one large greenhouse, digging out the floor and making a "tropical paradise." In addition, a butterfly house was created in a section of one house. In the mid-1990s, the Administration decided that these houses could not be maintained economically and would be torn down, resulting in a protest by students who wanted the greenhouses to be maintained. **Wayne Loescher** convinced the Provost that an appropriate solution would be to construct temporary plastic houses at the Horticulture Teaching and Research Center to house both the tropical collection and the butterfly house. (The butterfly house was later moved to the Plant and Soil Sciences greenhouse complex.)

Will Carlson designed the houses and **Bernard Zandstra** the footprint, and the University provided the necessary funds for several large plastic houses, some smaller hoop houses to replace those removed during construction, and a half-acre outdoor pad, with underground irrigation, for growing ornamentals. In the process a very useful facility replaced poor ones, and new roads were installed. Although the greenhouses were built to house the Botany plant collection, Horticulture also acquired additional space.

Tentative plans have been made for construction of a visitors' center, including a greenhouse range, at the corner of Farm Lane and Service Road. This would be a joint project between Horticulture and Botany/Plant Pathology. Once this is constructed, the plastic houses will not be needed.

Plastic greenhouses at the HTRC

7. Clarksville Horticultural Experiment Station (CHES) (440 acres)

The Department began considering consolidation of its field research facilities in 1970. Recommendations were made to the Agricultural Experiment Station that the research then being conducted at the South Haven and Graham Stations be consolidated at a new site nearer campus in order to reduce travel time, increase the land available for fruit breeding and vegetable research, and increase efficiency. The 440-acre Clarksville site was purchased in 1974. The station is located 46 miles west of campus, 20 miles east of Grand Rapids,

Clarksville Horticultural Research Station, aerial view

Main building

and only 18 miles south of Belding, an important fruit growing district. This area was chosen because of its elevation, which made it a good site for fruit trees. The Station was officially opened September 29, 1977. Chief participants in the opening ceremony were **Sylvan H. Wittwer**, Director of the Agriculture Experiment Station and member of the Horticulture Department, Dean **James Anderson**, Acting Chair of the Horticulture Department, **Donald Dewey**, State Senator **Robert Vanderlaan**, and State Representative **Stanley Powell**. A proposal was also made by the Agricultural Experiment Station for a 5-year budget to develop the Station. Although some peach trees had been planted earlier, major plantings were not established until 1980. At present, approximately 100 of a total of 400 acres are occupied by fruit plantings.

Robert Andersen was chair of the committee for developing the farm, which was completely paid for by April 1976. The annual budget request that year was $50,000. In 2000, the 25th anniversary of its establishment, the budget had grown to $400,000, with a staff of five full-time employees and three extension agents. **Gerald J. Skeltis** ('75) was appointed manager of the Station in 1979, and remains in that position today (2005).

Four 2500-bushel rooms were constructed in 1986 to evaluate emerging techniques for CA storage. The air separation technology now used world-wide was first demonstrated here (see information on storage in Research section).

Staff at Clarksville Horticultural Experiment Station. *Left to right:* Amy Irish-Brown, Donna De Young, Philip Schwallier, Gerald Skeltis, Gail Byler.

Staff members involved in vegetable research were not as well satisfied with the Clarksville site, however, and looked for other locations for research plots. The sandy soils in Southwest Michigan were more to their liking, and they preferred to use the Southwest Michigan Research and Extension Center, established near Benton Harbor in 1987-88 (see below.)

8. The Northwest Michigan Horticultural Research Station (100 acres)

In 1966, **Charles D. Kesner** (M.S. '62; Ph.D. '66) became the District Extension Horticulture Agent for Northwest Michigan. Kesner had earned his Ph.D. degree working with **Stanley Ries** on herbicide action, and was a well-respected source of information for fruit growers in the Traverse City area. Kesner and other MSU faculty conducted experiments on cooperating growers' farms with growth regulators and herbicides, trickle irrigation, training and pruning systems, harvest mechanization, pest control, and methods of reducing winter injury to the trunks of young cherry trees. The growers were so supportive of this work that they decided that an experiment station was needed.

Charles Kesner

The first step toward the establishment of this station was taken when the Grand Traverse Fruit Growers Council, representing fruit growers in Grand Traverse County, passed a resolution favoring its creation. Dean **James Anderson** of the College of Agriculture and Natural Resources, and **Sylvan Wittwer**, Director of the Agricultural Experiment Station at MSU, supported this resolution. The purpose of the station was to conduct research not only on cherries, the primary fruit crop in the area, but also on other fruits with potential for northwest Michigan. A local non-profit foundation, the Northwest Michigan Horticultural Research Foundation, representing growers in Manistee, Benzie, Leelanau, Grand Traverse and Antrim Counties, was formed in March 1978, and a Board of Directors with **Robert Underwood** as Chairman was elected. The Foundation subsequently raised $350,000 in cash and pledges from fruit growers, processors, machinery dealers, irrigation companies, financial institutions, and others with ties to the fruit industry, for the purchase of land, buildings and equipment. An

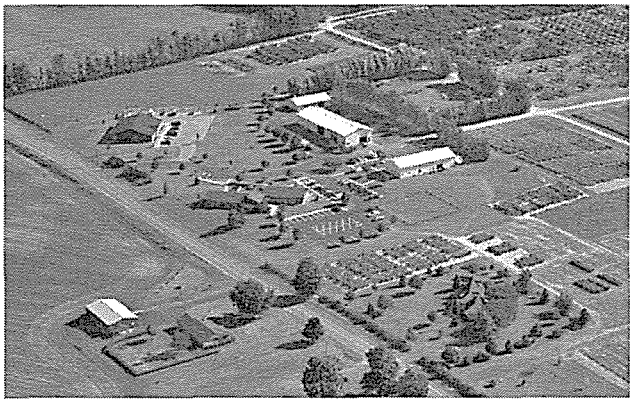
NWMREC staff, 2005. Left to right: J. Baase, M. Anderson, N. Rothwell, J. Nugent, A. Heins, Wm. Klein

additional $150,000 was donated in cash and in-kind items over the next 2 years.

In November 1978, an 80-acre farm in southeast Leelanau County on County Road 633, 8 miles from Traverse City, was purchased by the Foundation for $165,000. Horticulture Department Chairman **Kelly** and **Underwood** signed an agreement at that time establishing a working relationship between the Foundation and MSU whereby the farm was leased to MSU for a nominal sum, and MSU became responsible for research and an educational program at the station. Ground was broken for an office and storage facility on May 5, 1979, and an openhouse in September marked the official start of operations. **Kesner** was named coordinator, as part of his duties as District Extension Agent and Adjunct Professor. On Kesner's retirement in 1991, **James Nugent** ('72) became coordinator.

Since the station was established in 1979, facilities have been improved with the addition of 20 acres of land, a conference room, dormitory, equipment storage building, and upgrades to the laboratory and office. Extension activities at the station expanded in 1987 with the addition of a district agent for fruit IPM. Research activities have also changed to meet the evolving needs of the fruit industry. Most research still deals with cherries, but also includes apples, plums, and chestnuts. Early small fruit research on strawberries and brambles has been replaced with work on *V. vinifera* wine grapes. Research emphasis is focused on: improving fruit quality; enhancing production efficiency; finding fruit cultivars and production methods to meet evolving market needs and opportunities; advancing integrated pest management; managing nitrogen to meet production needs while minimizing leaching; and changing orchard ground cover management to improve carbon and nitrogen cycling.

9. Southwest Michigan Research and Extension Center (SWMREC) (350 acres)



Southwest Michigan Research and Extension Center (SWMREC), aerial view

Because of its heavy soil the Clarksville Station was not well suited to experiments with vegetables. Although some trials were run in the early years of operation, most of the research was done elsewhere. In addition, peach growers in southwest Michigan felt the need for a new research station to replace the South Haven Experiment Station, and with the support of State Senator **Harry Gast**, chair of the Michigan Senate Appropriations Committee, successfully lobbied the Legislature to provide funds for such a facility. In July of 1986 a bill was approved appropriating $25.79 million capital outlay; an initial $1 million of this was earmarked for establishing the station. **Hugh Price** was named chair of a 10-member site selection committee, appointed in May 1986. In December of the same year MSU bought the Walter Miller farm, a 350-acre property with sandy loam soil near Benton Harbor. The land was cover cropped during 1987, roads were constructed, buildings razed and plans made for new buildings.

The first plantings of vegetables, grapes, apples, peaches and pears were established in 1988, and work with vegetable crops at the Sodus Station began to be phased out. On July 1, 1989 **Tom Zabadal**, senior extension associate with Cornell University, became coordinator of the station, now designated the Southwest Michigan Research and Extension Center

(SWMREC). **Zabadal** established a very functional research center, with a close relationship with growers. In addition to his duties as coordinator, he conducted research and extension work on wine, juice, and table grapes. In 1989 **Chris Rajzer** ('76, M.S. '77) and **James Neibauer** (M.S. '74) were stationed at SWMREC as the fruit and vegetable district horticultural agents, respectively.


Tom Zabadal

In 1992 **William Shane** replaced Rajzer as the District Extension Fruit Agent for Southwest Michigan at SWMREC, with primary responsibility for evaluation and testing of fruit cultivars and rootstocks. Shane has continued the peach breeding work begun by **Johnston, Andersen and Iezzoni**, releasing 'Beaumont' in 2000. Upon Neibauer's retirement in 1996, **Ronald Goldy** (M.S. '80) was appointed as District Extension Vegetable Agent for Southwest Michigan, specializing in cultivar testing and cultural management.

The facility has a unique relationship with the government of Berrien County. In 1999 SWMREC became the home of the Berrien County Extension office, built on property leased to the County by MSU.

10. Oceana County Asparagus Industry Research Farm

Asparagus is the most important vegetable crop grown in Oceana County, where it accounts for a large part of Michigan's total production. Following the closure of the Sodus Experiment Station, local growers approached MSU and asked that a Station be established at Hart. No funds were available for this, so the growers formed a non-profit corporation, the Michigan Asparagus Research Committee, Inc., with local grower **John Bakker** as chairman, and in 1983 purchased 4.5 acres of land on old U.S. 31. An additional 1.5 acres was later leased. The Committee purchased equipment, installed a well, and hired personnel to oversee the plantings.

Research is funded by voluntary contributions from processors, packers and shippers to the Michigan Asparagus Research Committee; these are matched by grower contributions through the Michigan Asparagus Advisory Board.

Faculty members in the Departments of Horticulture, Crop and Soil Sciences, Entomology, and Botany/Plant Pathology provided advice and personnel to conduct experiments, which began with cultivar trials in 1983 and have since been expanded to include research on control of diseases, insects, and weeds. Faculty members plan the experiments and apply treatments, but the growers are responsible for day-to-day care of the plantings, harvesting, and recording of yield data. Horticulture faculty who have participated include **Hugh Price, Kenneth Sink, and Bernard Zandstra.**


SWMREC staff, 2005. Front row: V. Wendzel; M. Medina; S. Medina; T. Zabadal; S. Perez; M. Serrano. Back row: D. Dings; R. Goldy; G. Brunke; Wm. Shane; B. Hauch; M. Guerrero; R. Guerrero; D. Francis; D. Hulshof; D. Miner; R. Blighton.

Chapter 5

Spreading the Word -- Extension

Extension Introduced. The extension concept was implicit in the activities of the College soon after it was founded, for a major goal was to improve agricultural practices, not only by training students, but by "extending" knowledge to the public. Thus, the Farmers' Institutes were extension activities in practice, if not in name. The extension concept stressed on-farm demonstrations, however, whereas the Farmers' Institutes consisted primarily of formal lectures.

The first member of the Horticulture Department with specific extension responsibilities was **Oliver K. White** ('07), appointed to work with fruit growers in 1909, when the State Legislature appropriated $15,000 for extension activities.

O. K. White

In 1911-12 White made personal contact with many farmers. He gave a series of lectures in 25 fruit-growing communities, and presented demonstrations in orchards along well-traveled roads, making it easier for distant neighbors to attend. Subjects included cultivation, thinning, cover crops, packing, and how and when to prune and to spray for scale insects. He advertised by poster and in newspapers. Public demonstrations proved to be more effective in dissemination of information than visits to individual farms.

Smith-Lever Act. Congressional passage of the Smith-Lever Act in 1914 established the Cooperative Extension Service, and provided Federal funding to supplement State funds – $10,000 in 1915, increasing to $73,113 by 1919. Two additional horticultural extension agents were appointed that year – **Clarence W. Ward** in vegetables, and a third person to work on Farmers' Institutes and extension schools. Soon thereafter a fourth staff member began working with greenhouse and potato growers. During WWI the Federal government provided funds for emergency appointments of extension agents to encourage the production of needed crops. Thirty-seven new agents were hired with Federal funds in 1918 alone, but none was appointed in horticulture.

Fruit Concerns. By 1922 commercial fruit processing had become profitable, and extension agents provided information on this subject. In that year, 100 cultivars of apple were being grown in Michigan, complicating marketing. Therefore a standard list of 11 recommended cultivars was prepared [Duchess of Oldenburg, Wealthy, McIntosh, Fameuse (syn. Snow), Jonathan, Grimes Golden, Wagener, R.I. Greening, Steele Red, Northern Spy, and Hyslop Crab]. Even this list contained too many cultivars, however, for there was no market for "thousands and thousands of bushels" of Duchess in 1923. Growers were advised to top-graft other cultivars with scions of one of those recommended. Fourteen top-grafting schools were held in growers' orchards in 1924. The emphasis on top-grafting continued through 1936, when 186 persons attended such demonstrations.

Failure to spray for insects and diseases was listed as the limiting factor in Michigan fruit production in 1926. Fruit thinning was also being neglected. The "thin-wood" pruning system introduced by **Harold Gaston** and **Glenn Ricks** attracted considerable attention, and was considered "the most important horticulture project of the year" in 1936 (see research section).

Horticulture Programs on Radio and Television. Broadcasting of extension programs began in 1922, using the facilities of WSJ Detroit. MAC's own station – WKAR – began operation in March 1923, and radio courses were introduced in 1925. One of the first, if not the first, series of such courses offered by the Horticulture Department (April 1925) included 20-minute lectures by **Gardner, Edmond, Gunson, Starr, Lorree, Marshall, Dutton,** and **Halligan** on topics such as lawn care, orchard spraying, repair of rodent injury to trees, and culture of strawberries, brambles, asparagus, and tomatoes. Subscribers were provided with a synopsis of each talk prior to the broadcast. In Gardner's introduction he noted the importance of quality in marketing produce: "Consumers readily pay 15 or 20 cents a quart for fine, large berries, when they hesitate about paying two-thirds that amount for small, seedy ones..." He emphasized the necessity for better cultural methods to obtain high quality.

Beginning in the 1960s, the Department was asked to have one individual appear on WKAR every week to describe his or her program, give recommendations on a selected topic, or provide information on a coming event. Several Department personnel, including **Lee**

Taylor and Doug Badgero ('77), were invited to answer call-in questions. Members of the Department also presented information on the Farm Hour on WJR in Detroit.

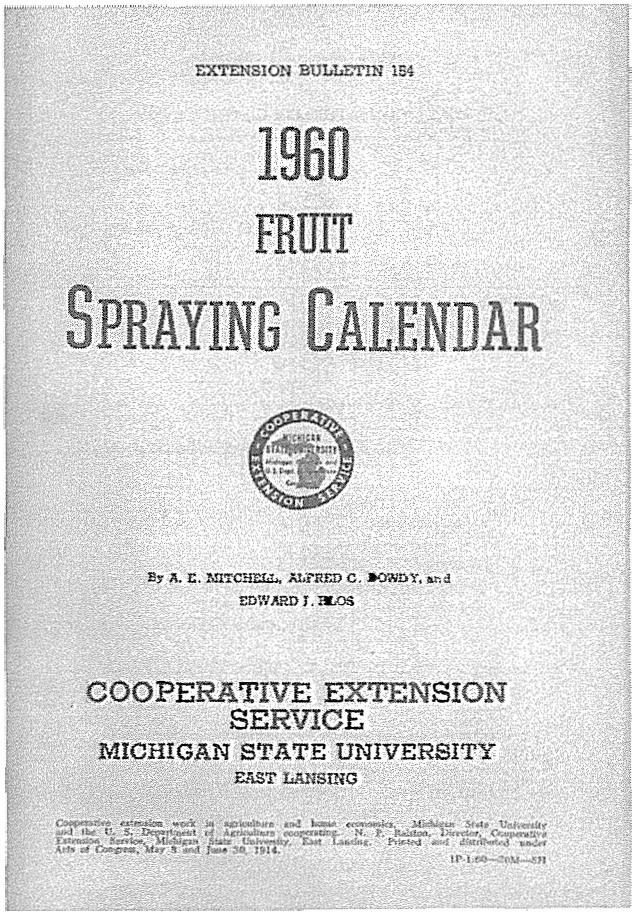
When television became available, many specialists demonstrated techniques or presented information on a topic or an upcoming program. Although brief, these sessions provided good exposure and a convenient way to publicize events or potential problems.

Home Gardens in War and Peace. During the Depression, extension personnel promoted home gardens and home canning, and a welfare garden program was instituted, supported with funds appropriated by the Federal Energy Relief Act. In 1935, 80,000 such gardens had been established on 2450 acres. A "Live at Home" project urged families to "Feed only what you can grow and grow only what you can eat." A "Subsistence Garden" project in Detroit in 1932 provided 6200 garden plots to residents. The emphasis on home gardens increased again during WW II, when the Extension Service initiated a national Victory Garden program under the motto "Feed the Family First." An extension agent was assigned to the Detroit area to assist adjacent counties in supplying the city with fruits and vegetables. By 1944, 720,000 Victory Gardens were producing an estimated 500,000 tons of food. **Paul Krone** directed the program from Detroit in 1945.

Extension Specialists. **Donald Hootman**, based in E. Lansing, was appointed Extension Specialist for tree fruits in 1924 and served in that capacity for 30 years. In addition to his regular duties, he was Secretary of the Michigan State Horticultural Society. In 1954 **Arthur Mitchell** was appointed as his assistant, with responsibility for the Society's annual trade show.

The two men later exchanged positions, Mitchell becoming Secretary, responsible for the educational program and Society business affairs, with Hootman as his assistant, responsible for the trade show. Mitchell earned a reputation as being very knowledgeable in many areas of fruit production, and served on both the Michigan Apple Committee and the Michigan Cherry Committee. **R. Paul Larsen** (Ph.D. '65) succeeded Hootman as extension fruit specialist in 1954, and worked closely with Mitchell, serving as the Society's educational coordinator until 1968, when he accepted a position as Director of the Tree Fruit Research and Extension Center at Wenatchee, Wash.

Harry Bell was named extension specialist for small fruits in 1953. When he took a position with Eli Lilly in 1964, **Jerome Hull** ('52 , Ph.D. '58), who had worked as Extension Field Specialist in horticulture at Purdue University, was hired in that position. When Larsen moved to Washington State in 1968, Hull became tree fruit extension specialist, but continued working with small fruits until **Stanley Howell** joined the faulty in 1969. In addition to his research responsibilities, Hull's duties involved planning for and attending extension meetings throughout the year, and setting up the program for the annual winter meeting of the State Horticultural Society – both time-consuming tasks. In addition he was responsible for operation of the Graham Station in Grand Rapids. Over the years, Hull became well known for his expertise and sound advice to growers. He retired in 1997.


EXTENSION BULLETIN 154

1960

FRUIT

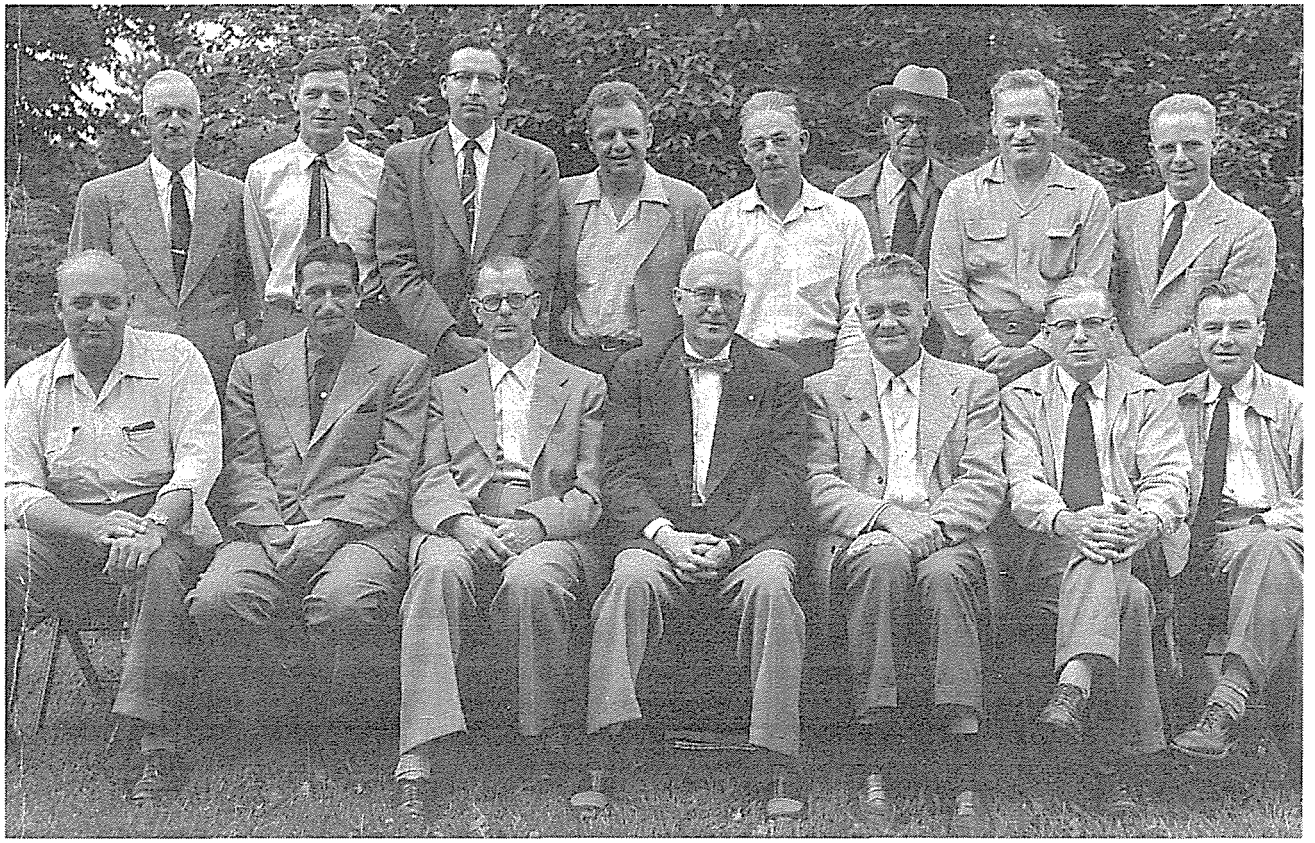
SPRAYING CALENDAR

By A. E. MITCHELL, ALFRED C. BOWDY, and EDWARD J. HILOS

COOPERATIVE EXTENSION SERVICE
MICHIGAN STATE UNIVERSITY
EAST LANSING

Extension bulletin by Mitchell, et al.

District Horticulture Agents. In July 1946 the Extension Service introduced the system of District Horticulture Agents with the appointment of **Ted Stebbins** for southeastern Michigan. These agents served several counties, rather than one, and were responsible for one commodity area, such as fruit, vegetables, or ornamentals. Stebbins's appointment was followed by that of **Carl Hemstreet** for the Grand Traverse area (1946), **Lyle Tomkins** for west-central, **Jerry Mandigo** (M.S. '54) for southwest Michigan, and **Russell Delp** for Detroit (all in 1948), and **Karl Bailey** for the east (1949). A State appropriation to the College in 1954 established a system of marketing agents to work with growers, processors and marketing agencies. The first of these agents to be appointed were **R. F. Bittner** (M.S. '33) for the southwest



Dr.Tukey with Horticulture District Extension Agents and Specialists about 1958.
Seated, left to right: L. Tompkins, District Agent, W. Central Michigan; A. Mitchell, MSU; C. Conrad, Berrien Co.; H. B. Tukey, Chair, MSU; D. Hootman, MSU; B. Musgrave, Extension District Supervisor and Asst. Director of Extension; R.F. Bittner, District Marketing Agent, Southwest Michigan. *Standing:* H. Cardinell, MSU; _____; R. P. Larsen, MSU; H. Bell, MSU; J. Mandigo, District Agent, Southwest Michigan, W. Toenjes, Supervisor, Graham Station; C. Mullett, District Agent, Northwest Michigan; T. Stebbins. Berrien Co.

region (1954), **George McManus Jr.** (M.S. '53) for the northwest (1956), **G. T. Stachwick** for the west-central (1957), and **Donald Hine** for the southwest (1960).

Evening College and Television Courses. The first evening college course in home gardening was offered by the Department in the spring of 1960. The first television gardening series, coordinated by **Donald Watson**, was aired on the Lansing Station WMSB and four other Michigan stations that same spring. In 1972, four evening college courses directed toward amateur gardeners were offered by the Department. Such courses continue to be popular today.

Home Horticulture Program. In the early 1970s home gardeners' needs for information had become a problem for extension agents and faculty members, as responding to increasing requests for information from homeowners required more and more of their time. In 1973, **Jesse Saylor** was employed as Home Horticulture specialist to meet this need. Saylor prepared notebooks with answers to questions often asked about horticultural plants, and supervised a group of undergraduate assistants who responded to some 5000 calls and letters annually.

The program was discontinued in 1980, but **Lee Taylor** continued to respond to homeowner and extension agent requests, and wrote several extension publications to answer common gardening questions. Subsequently, the Master Gardener program (see below) was initiated to respond to some of these questions.

General Duties of Extension Agents. From 1960 though the 1980s, extension specialists served both commercial and non-commercial clientele by planning horticultural events and shows, day and night meetings, and visits to growers, extension offices, businesses, and homes. Many faculty without extension appointments also assisted with these activities, especially at statewide and regional meetings.

Specialists were also expected to respond to messages, and to answer requests from extension field staff and other visitors who dropped by their offices. Numerous meetings, both on and off campus, were time-consuming, and often not very productive. As budgets continued to be cut, specialists had to spend more time finding funds to support their programs.

Extension publications were a very important means of providing information; some were produced annually to help keep clientele up-to-date. Their preparation was usually very time-consuming, as most of them had to be reviewed in the departments before being forwarded to the extension publications office for editing and printing. Nevertheless, they increased specialists' productivity by making written information available to county extension offices and interested individuals; often, extension office or departmental secretaries could provide the requested information or refer the request to an appropriate source. Specialists also provided slide sets and videos for their clientele. Later the internet was used.

Given budgetary constraints, the Department tried printing several of the more popular extension bulletins on newsprint, which greatly reduced costs, and began to charge for publications that had previously been free. Some counties started making copies in-house to reduce the cost. Extension travel budgets were also cut, necessitating charging participants at meetings in order to pay specialists' travel expenses. In the 1990s, e-mail messaging grew in importance as county extension offices and individuals obtained computers and were able to access the internet.

Lawn and garden shows were popular, and were convenient and efficient ways to reach homeowners. Kalamazoo County hosted such an event for many years, assisted by extension personnel from surrounding counties. A similar event was held at the Michigan State Fairgrounds in Detroit, where specialists provided some of the programs.

Currently, regular meetings are held for agents to keep them informed of research in all aspects of horticulture. In addition, grower meetings are scheduled at various sites around the state at which faculty provide information on their specialties. Grower organizations, such as the Michigan State Horticultural Society, the Michigan Vegetable Council, The Michigan Nursery and Landscape Association, the Michigan Grape and Wine Industry Council, the Grand Traverse Fruit Growers Council and the Benzie/Manistee Fruit Growers, also hold annual meetings that include both trade shows and in-state and out-of-state speakers.

Programs in Floriculture

A noted above, information on gardening was offered in Farmers' Institutes. By 1933 floriculture had become a commercial industry in Michigan, with a store value of $ 3.5 million and 7 million ft.^{2} under glass. By 1937 flower crops worth $12 million were being produced in 600 greenhouses covering 11,000 acres. Production of Dutch bulbs, gladioli, and dahlias also increased during the decade. Nevertheless, the Depression was in full sway, and flowers were not considered to be a priority for extension programs, leading to the formation of the Detroit Flower Growers Association (now the Metropolitan Flower Growers Association).

Spartan Ornamental Network (SON). In the early 1980s the University began developing a computerized information network to connect all county extension offices with extension headquarters on campus. At the time, only printer terminals, not computers, were available in county offices, so all information was sent in printed form; this included a bulletin board with suggestions on production of bedding plants.

Will Carlson was instrumental in pioneering the SON system for greenhouse growers. In 1983 three commercial greenhouse operations (Bordine's in Rochester, Henry Mast Greenhouses in Benton Center, and Kalamazoo Valley Plant Growers Cooperative in Kalamazoo) agreed to participate in the system on a trial basis. The information included was based on their suggestions.

Access to the system was a problem at first; only two campus phone lines were available, many growers did not have dedicated lines or even a computer, and long-distance calls were expensive. Annual cost of access was $150 for Michigan residents, $ 250 for all others. However, by 1985, 16 ports had been added for phone access to campus, and SON became available on computer-dedicated lines, thereby reducing the cost.

In 1983, **Sandy Allen** was hired as a full-time manager for SON, using extension funds and industry grants. The Cooperative Extension Service developed data bases and bulletin boards for the system, including information on fertilizer calculations and on specific crops. This information was expanded dramatically in 1985-86, with the addition of recommendations for landscape plants, fruits and vegetables. By 1989 the system had a total of 100 subscribers in the United States and Canada.


Sandy Allen

New Research on Bedding Plants. In the early 1960s growers of vegetable crops such as tomatoes and peppers had few markets. They had small greenhouses for producing transplants, but California growers, who could grow plants year-round, were becoming very competitive. **John Carew** suggested that bedding plants be grown instead of vegetables, and that a con-

ference be held to provide information. An initial meeting in the Kellogg Center was successful and was followed by a second and a third, all on campus. With this encouragement, a new organization – Bedding Plants Inc. (BPI) – was formed in November 1969, and grew rapidly. **Will Carlson** served as executive secretary, and ran the operation with minimal facilities out of the basement of his home with his wife, **Barbara**, as secretary. Later a building was purchased to serve as a headquarters for the organization.

BPI provided high visibility to MSU programs and increased contacts among growers. The name was changed to Professional Plant Growers (PPG) in the 1980s, and later to Bedding Plants International. Today a spin-off of BPI, called the Floriculture Industry Research and Scholarship Trust (FIRST), which includes the Ohio Florists Foundation, provides research grants and scholarships, a total of $100,000 having been awarded in 2001.

Fruit Schools. Ronald Perry initiated a program of fruit schools in 1984. Their purpose was to provide up-to-date information on all aspects of fruit production in a classroom format for persons who had taken no college courses in pomology or had taken such courses some time ago. The 3-day programs were initially held at the Kellogg Biological Field Station near Battle Creek, and topics (rootstocks, training and pruning, nutrition, etc.) were rotated from year to year. Most of the lectures were presented by professors from MSU and other universities. In addition to lectures the schools featured field experience in pruning and other practices. Over 700 participants, from both Michigan and out-of-state, attended during a period of 14 years. Although the schools were discontinued in the late 1990s, they provided a model for similar programs in other disciplines and states.

Controlled Atmosphere (CA) Storage Clinic. Donald Dewey initiated a series of meetings to provide information for operators of controlled atmosphere storages. A meeting is held every other year, and **Randy Beaudry** and invited specialists continue to provide updates on procedures.

Programs in General Horiculture

Garden Days. An extensive series of programs is offered by the Horticulture Gardens staff, the most important being Garden Day in August, when invited speakers present talks on numerous aspects of gardening for amateurs. Topics cover annuals, perennials, trees, and herbs. Additional workshops are available throughout the year.

Master Gardener Volunteer Program. This program, which originated in Washington State in 1972, was introduced in Michigan by **Donald Juchartz** ('51, M.S., '59), horticultural extension agent in Wayne County. The purpose was to develop a group of paraprofessionals with knowledge of horticulture who could respond to homeowners' questions regarding gardening, and thereby reduce the burden on county extension agents. Twenty-five students, most of them from Grosse Pointe, enrolled in the first class, held there in 1978; the program then expanded to neighboring counties.

Soon the necessity for central coordination became apparent. In 1989 the Department of Horticulture took over management of the program from MSU Extension, and appointed **Ralph Heiden** (M.S. '87), as the first coordinator of a state-wide program. Following Heiden as State Coordinator were **Tom Stebbins**, appointed in 1990 and **Mary McLellan**, appointed in 1992. In 1994 an Advisory Committee, consisting of county extension educators, was established to provide advice on statewide needs, policy, goals and objectives. Currently fees paid by the program participants partially fund the program.

To qualify as Master Gardener Volunteers, candidates must take a 3-month training program that includes instruction in basic plant science, as well as all aspects of plant care. These classes are taught by extension personnel, MSU staff and others with knowledge of a given subject. Candidates must pass a comprehensive take-home exam requiring application of the information covered, and agree to provide 40 hours of volunteer work to earn their basic certification. Continuing education credit and volunteer hours are required annually to maintain certification.


Mary McLellan

From the original 25 volunteers, the number of persons completing the training program has grown to more than 25,000, of whom 4000 to 5000 are currently active. A State-wide quarterly newsletter, an annual conference in June at MSU, and various educational

opportunities around the state keep volunteers informed of current events and advances in horticulture.

MSU Horticulture Gardening Institute (HGI). This Institute, a joint initiative of the Master Gardener Program, the Department of Horticulture, MSU Gardens, and MSU Global, was organized in 2002 as an "event-centered, on-line-supported" learning model, with self-directed programs and hands-on gardening opportunities. The program sponsors instructional on-line programs in gardening for a national audience of gardening enthusiasts and master gardeners. It provides on-line resources, certificates of completion, a one-year membership in the American Horticultural Society (AHS), a subscription to AHS's "The American Gardener" magazine, and Master Gardener educational credits in other states. Current on-line programs include Container Gardening, SmartGarden, Herbaceous Perennials for the Sun, and Herbaceous Perennials for the Shade. The program was developed by **Mary McLellan**, State coordinator of the Michigan Master Gardener Volunteer program and Co-Executive Director of the Horticulture Gardening Institute, and **Christine Geith**, Executive Director of MSU Global Institute.

Areas of Expertise (AoE) Teams. The Areas of Expertise concept for extension programs was introduced in the mid-1990s; its purpose was to encourage interaction between research and extension personnel working in similar areas within and across departments. The charge was to identify priorities of growers ("stakeholders"), plan and provide educational programs, and evaluate program outcomes and impacts.

Each team has co-chairs, one from on-campus and one from off-campus, and a "problem-solving, customer-oriented focus." Three of the 24 teams deal with horticulture, including fruits, vegetables, and ornamentals. The teams are further sub-divided into special topic groups; the ornamentals team, for example, includes consumer horticulture, floriculture, turf, and woody ornamentals. Four teams (farm management, land use, food safety, water quality) are multidisciplinary, and another six (volunteerism, community development, state and local government, tourism, youth development, and leadership) are multi-disciplinary but relevant to horticulture.

Floriculture College of Knowledge. The Floriculture College of Knowledge was developed by the floriculture Area of Expertise Team between 1999 and 2001 to assist greenhouse growers in improving their knowledge and skills for career enhancement. Participants can enroll in a series of twelve 4-hour courses, ranging from pest and disease control to management of the environment. Textbooks, bulletins, and other information are included in the registration fee. As of 2005, over 400 people from 21 states and four countries had participated. In 2002 the Team won the MSU All-University Excellence in Diversity Team Award for its Spanish version of the program. Beginning in 2002, the program has been offered annually at the Ohio Florists Association short course in Columbus in July and at the Michigan Greenhouse Growers Expo in Lansing in November.

Given the success of these programs, faculty and extension agents in Horticulture and Agricultural Economics joined forces in offering a Business College of Knowledge in November 2005. This consisted of four courses for greenhouse and nursery owners and managers, dealing with managing employees, marketing, financial management, and strategic planning.

Chapter 6

Beauty for All – Gardens and Arboretum

The first Horticulture Gardens were located at the center of the present East Circle, just east of what is now Old Horticulture, and were used as test plots for horticultural crops. The trees used in 1889 by **L. R. Taft** for his experiments with fungicides were located here, as were plantings of vegetables.

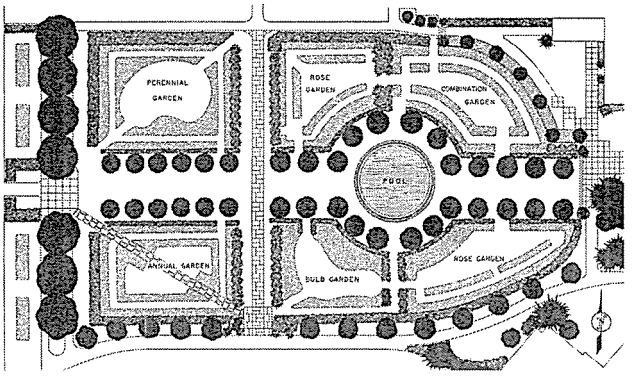
In the early 1930s display areas were designed, probably by **T. Glenn Phillips**, then College Landscape Architect. These consisted of a central grass area, surrounded by long rectangular beds of roses, annuals, perennials and bulbs grown for class use, as well as test plots of rose, dahlia and other flowers. The garden extended south to East Circle Drive and east to the area where the Student Services Building now stands, and drew an estimated 40,000 visitors during the summer of 1935. The eastern part contained ornamental evergreens, shrubs, flowering trees, and a path with an overhead trellis.

In the late 1940s disagreement arose between Botany and Horticulture as to who should be responsible for campus gardens, and **President Hannah** settled the matter by assigning responsibility to Botany for the Botany and Beal gardens and to Horticulture for the display gardens. Horticulture would also serve all the buildings on campus, as well as campus events, with flower arrangements.

At the same time, changes in the Horticulture Gardens were necessary, for the Natural Sciences Building was soon to be built and Student Services was in the planning stages. Sizable areas at the east and south ends of the gardens were lost to these two buildings and their adjacent parking areas, and some of the annual flower plantings were moved temporarily to an area where the Plant Science greenhouses now stand on Farm Lane.

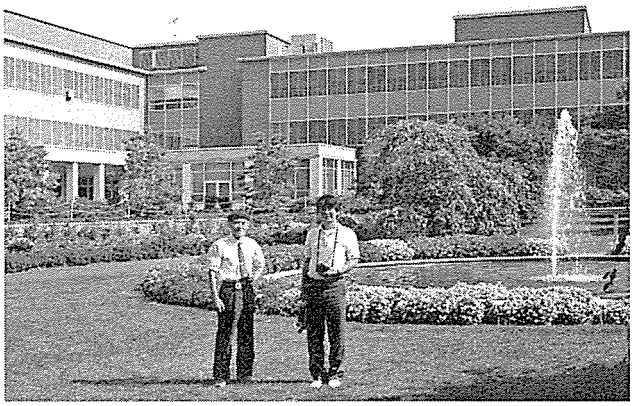
In 1948 Prof. **Harold Lautner**, Chairman of the Landscape Architecture Department, who was responsible for these changes, assigned Prof. and Assistant Campus Landscape Architect **Milton Baron** to work with **Harold Tukey** in designing a detailed master plan.

Two concerns were involved in planning the new garden – cross-walks that would allow ready access from one building to another, and the creation of an attractive effect in the center. The latter was achieved by including a mall, with a pool and fountain, enclosed by 'Red Jade' crabapples. The antique wrought-iron fountain that had been in a garden northeast of the new library was rescued and transferred to the new garden. Baron created six enclosed gardens surrounding the mall and pool. A terrace with a picturesque Scots pine next to the Student Services Building completed the vista. (As a gift of the Class of 1978, the pool was con-



Plan of Horticulture Gardens.


Gardens in spring.


Garden and pool, with Student Services Building in background.

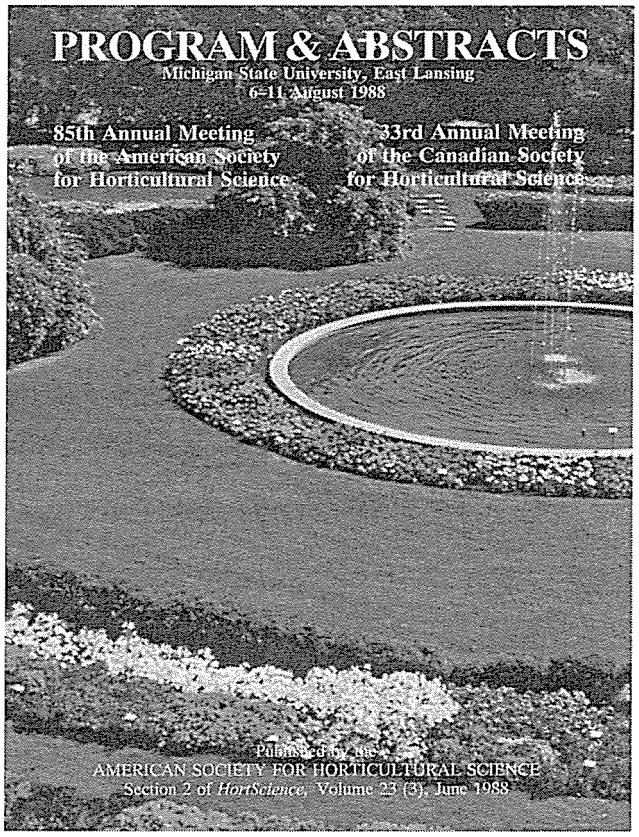
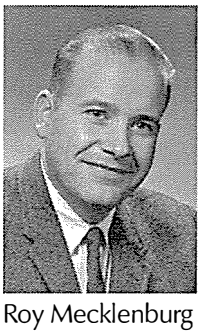


Photo of garden on cover of program for ASHS meeting at MSU, 1988

siderably enlarged and a showy jet fountain installed in that year.)

The design emphasized dual use for both teaching and for the enjoyment of students and visitors. The unique concept had six connected units, including annual gardens, perennial gardens, a bulb and tuber garden, and a rose garden. This integrated system, with lighting at night, contained plants that would be in flower from spring through fall.

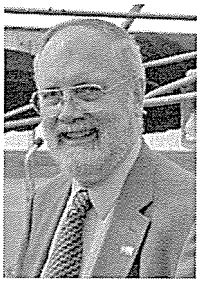
Carrick Wildon established extensive dahlia trials here, financed by the American Dahlia Society, and in the 1950s and early 1960s **Richard Stinson** made attractive plantings of perennials, including roses. Jackson and Perkins released its 'Spartan' rose in 1955 in honor of MSU's centennial, and **Clark Paris** (Ph.D. '56) took over the annuals. **Roy Mecklenburg** ('56) was in charge of the gardens in the early 1960s; **Will Carlson** replaced him when Roy left the Department in 1977. By 1971 the gardens had become a popular place for weddings; 12 were held there that year.


Roy Mecklenburg

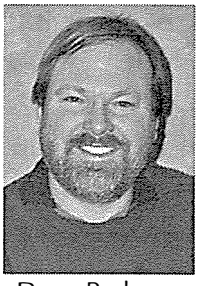
In 1978 MSU was asked by All-America Selections and professional seed producers to begin participating in the network of 28 floral trial gardens scattered across the United States, and Lowell Ewart took responsibility for the MSU trial garden. Flower seed companies decided what flowers would be tested at each site, and submitted hundreds of varieties for testing under Michigan conditions. The MSU trial garden consisted of about a half acre containing 30,000 plants. The bedding plants were started in the horticulture teaching greenhouse in March-April, then transplanted. Each variety was assigned a number and evaluated by a judge three times during the summer, and the information was published at the end of the season. Bedding plant producers met there in early August to evaluate the varieties and decide which to grow the following year. In the late 1980s, the trial garden was moved to the new Horticulture gardens, west of the Plant and Soil Sciences building; **Norman Lownds** ('78, M.S. '84, Ph.D. '87) is the current coordinator of the annual trials.

The New Horticulture Gardens

Will Carlson, together with **Jane L. Taylor** of the Michigan 4-H Foundation, began planning and raising funds for the new gardens in May of 1987. Many faculty members in both Horticulture and Crop and Soil Sciences were skeptical about the possibility of raising the estimated cost of over $1 million in private donations to develop over seven acres of gardens, but Carlson and Taylor realized their dreams, for nearly $3 million had been contributed by the time the gardens were dedicated in August 1993. All of the funds for construction were supplied by private donors. **Doug Badgero** ('77) greenhouse and garden supervisor, is currently responsible for maintaining the facilities and plantings.


Will Carlson


Jane L. Taylor


Doug Badgero

The gardens have become the pride of the University and have been nationally acclaimed. The 4-H Children's Garden in particular has become a model for similar gardens in the United States and abroad.

Work on planting the new garden began in 1989, soon after completion of the Plant and Soil Sciences Building. All of the perennials were transplanted from the beds in

the old garden, then measuring only 1500 ft². to the new 18,000 ft². perennial display garden, with hundreds of plants being added. The perennial garden was completed first, then the annual garden, and finally the rose garden.

The main gardens were constructed to the south and west of the Plant and Soil Sciences building, and consist of a large, informally designed perennial garden, a more formal annual garden that also functions as one of the sites for the All-American Selections Trial Garden, and a 4-H Children's Garden. Visitors can enter the gardens from the east, north, or west.

From the parking area on the east, visitors pass through the entrance pavilion, sponsored by the **Bordine** family, with a double row of classical columns and an overhead trellis. The pavilion contains a copper-leafed beech in a central planter, hyacinth bean vines provide shade and beautiful purple flowers, and hanging baskets contain colorful annuals. The pavilion opens on a winding walkway, with bricks inscribed with names as memorials to alumni, faculty, and friends. This passes through the **Judith A. DeLapa** Perennial Garden, containing over 400 species of woody and herbaceous perennials, including ornamental grasses. The brick path leads to the Orientation Plaza, with compass directions on the granite floor, given by the employees of the John Henry Company in honor of **Louis J. Brand**, former President and Chairman of the Board. Turning south from the Plaza one enters the Rose Garden, sponsored by Frank's Nursery and Crafts, with some 700 cultivars of roses, including many All-America Rose Selection winners. Turning north leads to the Conservatory Plaza at the western end of the Conservatory, dedicated to **Paul Ecke, Sr.**, and to the **Amien and Florence M. Carter** Annual Garden, one of 33 All America Display and Trial Gardens in the United States. This contains some 1000 cultivars of petunias, impatiens and other annual species available from seed companies.

On the eastern end of the Annual Garden, next to the Plant and Soil Sciences Building and framed by Roman arches, is a statue of **L. H. Bailey, Jr.** by **Linda Ackley**. On the western end is "Windows"– a column sculpted by Mel Leiserowitz and given by **Carol G. Gadsden** in memory of her husband, **J. Donald Gadsden**. The column bears bas-reliefs of scenes one might see when looking out the windows of a home, including garden flowers, grain fields, and even clothes on the line. In the allee between the Bailey statue and the column are the Post Gardens Fountain, sponsored by **Nancy and Ed Tuinier**, which stands in the center of four sunken gardens, and "Sunseed," a stainless steel column crowned by a representation of a seedling emerging from a seed, designed by MSU Alumnus **O.V. Shaffer** and given by **E. J. and Julia Crozier McCleary.**

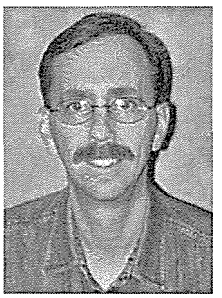
The **Samuel Synge Carter** and **Dorothy Carter Mayhew** Foyer Garden, located on the north side of the building, is separate from the other gardens, and contains annuals, including impatiens and summer vegetables. It was given in Samuel and Dorothy's memory by their brother **Amien A. Carter.** Numerous other plantings, funded by friends of the gardens, add beauty to the scene.

The Michigan 4-H Children's Garden was begun in 1991/2 and completed in 1993. It contains some five "minigardens" built on themes children know best. The purpose, according to Curator **Jane Taylor,** was "to help children understand the importance of plants, to promote healthy environmental attitudes … and to do it with a hands-on approach."

In its August 8, 1993 edition the Lansing *State Journal* provided the following information on the new gardens:

> "Here are a few [things to see]: 68 varieties of geraniums, 98 varieties of petunias, 26 varieties of dianthus, 150 varieties of roses and more than 1,000 varieties of bedding plants. In the 4-H Children's Garden, there are 50 mini-gardens, including an Alice in Wonderland maze leading to a secret garden, a walk-in sundial, an amphitheater, a butterfly garden, an African-American garden, topiary bears and a pizza garden containing peppers, tomatoes, onions, basil, oregano and thyme."

Following Jane Taylor's retirement in 1996, **Norman Lownds** became Director of the Children's Garden. He has introduced numerous innovations, including a website and interactive computer-assisted learning activities, both in the garden and in the Plant and Soil Sciences Building.

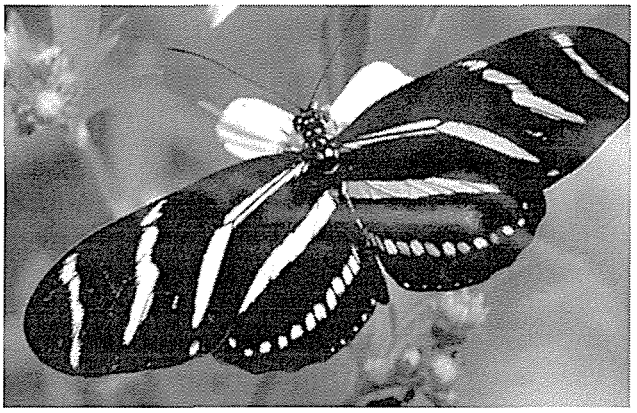

Norman Lownds

Today the gardens, including the Children's Garden, cover about 7.5 acres, and are enjoyed by some 200,000 visitors each year. They are popular as a site for special events, such as weddings and receptions, during the summer.

Gardens Inspire Symphony. In 2000, Pulitzer prize-winning composer **Ellen Taafe Zwilich** wrote a symphony inspired by MSU's gardens, including those maintained by the Horticulture Department. The symphony was commissioned by **Jack and Dottie Withrow** of Bloomfield Hills to pay homage to the beauty of the campus, and the world premier was performed in the Wharton Center on February 5, 2000, by the Univer-

sity Orchestra, led by **Leon Gregorian**, together with the State Singers, the MSU Choral Union, and the MSU Children's Choir.

Old Horticulture Gardens Dismantled. Following the move to the new gardens, the Department was unable, barring increased funding, to maintain the original Horticulture Gardens adjacent to the old Horticulture Building on North campus. The area was therefore converted to a green space by Campus Park and Planning, retaining the mall, with its pool and fountain. Students were upset that one of their favorite spots for rest, relaxation and study would not be available, and in 1989 collected 2000 signatures protesting the move. The old greenhouses, now obsolete, were eventually dismantled and the area made into a temporary parking lot, but only after a controversy, again with students who wanted to preserve them and their contents for aesthetic reasons.



Butterfly House/ Indoor 4-H Children's Garden

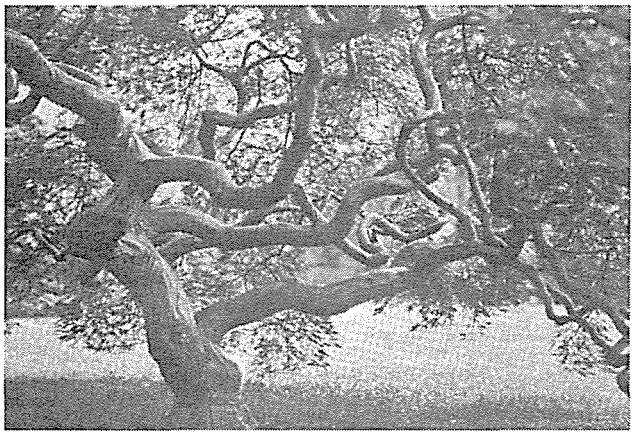
The butterfly house was developed by **John Mugg**, supervisor of the Entomology greenhouses, and maintained in the old Horticulture greenhouse. When that greenhouse was torn down, space was made available in the Plant and Soil Sciences greenhouse, and eventually came under Horticulture's supervision. Later this house was redesigned by **Norman Lownds** to become the Indoor 4-H Children's Garden, which contains another 20 "minigardens." A "Butterflies in the Garden" event is held each year, which is popular with both children and adults. Pupae are purchased, and develop into butterflies within the greenhouse, where they feed on nectar from flowers, supplemented with sugar solutions.

Clarence E. Lewis Landscape Arboretum

Clancy Lewis

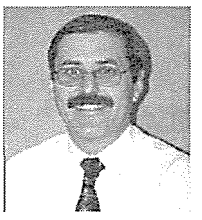
The arboretum was designed as an instructional area for students interested in landscape development, and was dedicated to **Professor Clarence E. ("Clancy") Lewis**, a master photographer and teacher of woody plant materials beloved by students and amateur horticulturists nation-wide.

Clancy taught for 35 years and won citations from MSU and the American Horticultural Society for being an outstanding and devoted teacher. His work earned him other prestigious awards, such as the Arthur Hoyt Scott Garden and Horticultural Award and the Award of Merit from the International Society of Arboriculture and selection as a Fellow of the Garden Writers' Association of America. He accentuated the art and science of horticulture by teaching us how to preserve and develop our passion for plants. He died in 1985, but his legacy lives on in this arboretum.



One of Lewis's photographs

Under the leadership of **Robert Schutzki** of the Horticulture Department, the arboretum began to take shape in 1983 on the site of the former campus landscape nursery at the corner of Bogue St. and Service Rd. Funds were supplied by alumni, industry personnel, nursery and landscape associations, and friends, and the arboretum was dedicated on July 10, 1984.



Robert Schutzki

The arboretum is a collection of gardens, both for teaching and as a source of ideas for professional landscape designers, home gardeners, and the public. A range of genera and species, including many specimen trees retained from the original nursery, are included.

Dedication of the Arboretum, July 10, 1984.
Tom Kehler, Director, Campus Park and Planning, Lewis, Jack Breslin, Vice President for Administration and Public Affairs, Charlotte (Mrs. Clarence) Lewis, Jack Kelly.

The facility echoes **Lewis**'s words: "Let our imagination run a bit, don't just concentrate on the ground, look up to enjoy what is overhead, look through the foliage, the canopies, look to the area beyond, see the patterns, the pictures, the twisting and turning of the branches... Remember that trees can do so many things in a garden... Remember trees are for you!"

Gardens Within the Arboretum. The Arboretum continues to grow. It currently contains not only the original evergreens and shrubs planted at the dedication but many additional components, all made possible by generous gifts.

Kathleen and Milton Muelder Japanese Garden. Former MSU provost Milton Muelder and his wife Kathleen provided the funds for this garden, dedicated May 12, 2000 as a memorial to Muelder's experiences in helping to establish the University of the Ryukus in Okinawa in the early 1950s. The central pavilion contains a courtyard with raked gravel and large stones associated with Zen temples, and is surrounded by specimens of Asian flora, including striped bark maples, Japanese and Korean hornbeams, and many evergreen and flowering shrubs.

Harold and Martha Davidson Bird, Butterfly, and Hummingbird Garden. This garden, established with a gift from Professor Emeritus of Horticulture Harold Davidson and wife Martha, has a pavilion as a focal point, and contains species of plants that attract birds, butterflies and hummingbirds.

The Jane L. Smith Conifer Garden. Completed in 1995 as a gift of the Capital Area Landscape and Nurserymen's Association (CALNA) in honor of Smith's many contributions to the industry, the garden contains dwarf and unusual conifers.

The Central Court. This garden was constructed in 1994 by members of the Metropolitan Detroit Landscape and Nurserymen's Association (MDLNA) in honor of **Judy Shubert**, former Executive Secretary of the organization, who was killed in an auto accident in 1993.

The Yvonne Wilson Native Plant Garden. Ms. Wilson, an avid gardener and longtime friend of the Department, provided the funds for this garden, which contains a pond and a bluestone patio, surrounded by boulders.

The Victor M. and Alice K. Guernsey Michigan Garden. Donated by their children in memory of the Guernseys of Cass City, both MSU alumni, the garden represents a dense forest floor, and serves as an atrium to the arboretum. A granite patio forms the map of Michigan, with sections representing each county. A wide array of floral and foliage plants are complemented by ferns and evergreen shrubs.

The Philippa M. Webb English Garden. This formal garden, enclosed in a brick wall, contains arborvitae as a border for annuals, roses and other perennials typical of British gardens. A long pond is a central feature, and an allee of flowering pear trees extends from the western exit. The garden was donated by **Dr. Charles Webb**, Vice-President for Development at MSU, in honor of Ms. Webb, an academic specialist and team coordinator in the Department of Education's Teacher Preparation Program.

The Chandler Blake Greenhouse. The Blake family donated the greenhouse to the garden in 1995. Students dismantled and reconstructed it, built the surrounding brick walks and patios, and designed the adjacent vegetable garden.

Mawby Fruit Collection. The Mawby Fruit Collection was established with a gift from the **Russell ('51) and Ruth Mawby** family, and contains fruit

plants representing the diversity of Michigan fruit production. These include both tree (apple, peach, pear, cherry, plum) and small fruits (strawberry, brambles, grape, cranberry), together with some less familiar species (kiwi, paw paw, medlar, nut trees). The garden was designed to demonstrate cultural practices and provide a working laboratory for students, professionals, and the general public. Both historical and current cultivars are included, the first plantings having been made in the spring of 1993.

Hidden Lake Gardens

In 1945 a committee from the College met with the owners of Hidden Lake Gardens, **Mr. and Mrs. Harry A. Fee** of Adrian, to discuss their plans to give this facility to the College. The original 228.6 acres of land, located on Route 50 in the Irish Hills near Tipton, were purchased by Fee in 1926 to use as a farm for his retirement, but the rocky, heavily wooded land, which had been subjected to glacial action, was not suitable. Furthermore, during the Depression Fee did not need the income that would be obtained by competing with other "true nurserymen." The Fees therefore converted the area to a private "landscape garden," including a lake, trees, shrubs, a rock garden, and perennial flowers. Mr. Fee felt that nature should "create pictures," and that "plants do not march in rows," and his plantings followed these rules. He made extensive use of the MSC Extension Service for advice.

The property was donated to the College in 1945, together with an endowment for its support; subsequent purchases had increased the acreage to 757 by 1993. The Gardens were administered by a committee consisting of representatives from the Departments of Forestry, Botany, Landscape Architecture, and Horticulture. In 1958 **President Hannah** assigned responsibility of operations to Horticulture. At that time, the purpose of the gardens was outlined as (a) a landscape park for public enjoyment and appreciation, (b) conservation of land forms and indigenous plants, (c) horticultural research in breeding, testing, and demonstration, and (d) teaching, with possible use for conferences, field trips, and courses.

The first superintendent of the gardens was **Clarence E. Hoxie** ('32, M.S. '33). **E. I. Wilde** took over from Hoxie for a short while in 1949. He had retired after 36 years of teaching and research at Penn State, where he had established an All-American test flower garden. When Wilde died in August, **F. L. S. O'Rourke** became director. O'Rourke resigned as Director in 1955 to take a position with the USDA in Ecuador, and **Fred W. Freeman** succeeded him.

In May 1961, at **Dr. Tukey's** request, management of the Gardens was turned over to the Division of Campus Park and Planning (CPP). Freeman remained an Assistant Professor in Horticulture, but was responsible to CPP. On Freeman's retirement in 1986, **Harold Lautner**, Director of the CPP from 1946 to 1970, had this to say about him: "It was around his personality, excellent public relations and management that the Gardens grew and became one of the finest facilities of its kind in the country."

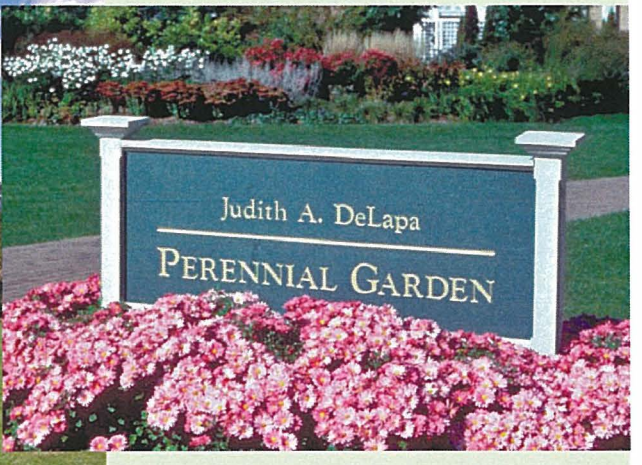
Numerous improvements were made under the supervision of **Prof. Milton Baron** of CPP. The attractively landscaped entrance includes a large granite boulder with a plaque dedicating the garden to Michigan State College as a gift of the Fes. Three miles of hiking trails are available, and six miles of roads pass along the lake, through oak and hickory forest with scenic overlooks, including the glacial kettlehole, and a 120-acre arboretum. The limestone Visitor Center, dedicated in 1966, contains geological and horticultural exhibits, classrooms, and an auditorium. A short walk through a rhododendron collection leads to a greenhouse conservatory, completed in 1968, with domes of unusual design, housing economically important tropical species, indigenous desert plants, and temperate zone floricultural species. The Herrick Foundation provided funds for both of these buildings. The bonsai courtyard includes the **Elsie MacCready** Memorial Bonsai Collection, maintained by bonsai master **Jack Wikle** (M.S. '60). This collection, a gift of **Mr. and Mrs. William Haselwood**, ranks with the finest in the nation. Other exhibits include a boxwood collection, the Hosta Hillside Garden, donated by the Michigan Hosta Society, and the Harper collection of over 500 dwarf and rare conifers, a gift of **Justin C. (Chub) Harper** in 1981.

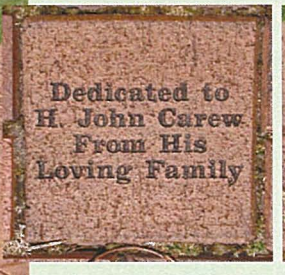
On Freeman's retirement, **Jack Wolff** became director, and served until 1999, to be succeeded by **Ellyn Meyers. Frank Telewski** acted as as Interim Director from October 2003 until June of 2006, when **Steve Courtney** was named Manager. **Gerald Donaldson** ('76) supervises the grounds. The Garden serves as an outreach education facility, financed by gifts from the Fee Estate, the Herrick Foundation, and others, and is a member of American Association of Botanic Gardens and Arboreta.

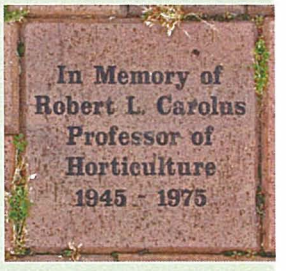
Wilbir

Entrance pavillion

MSU Horticultural Gardens



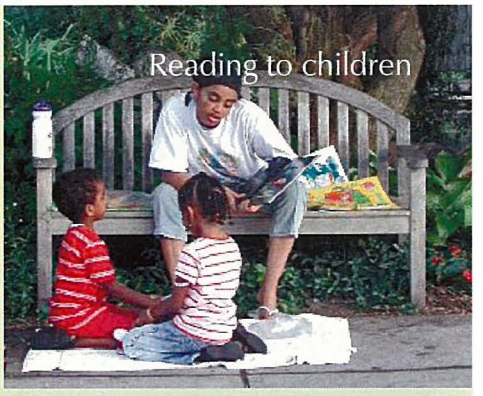


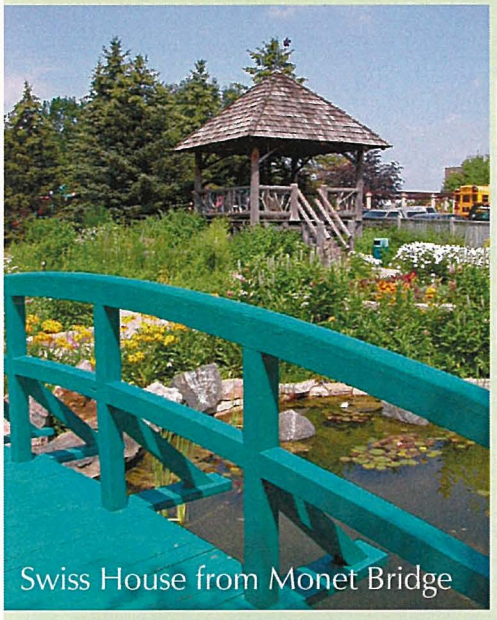


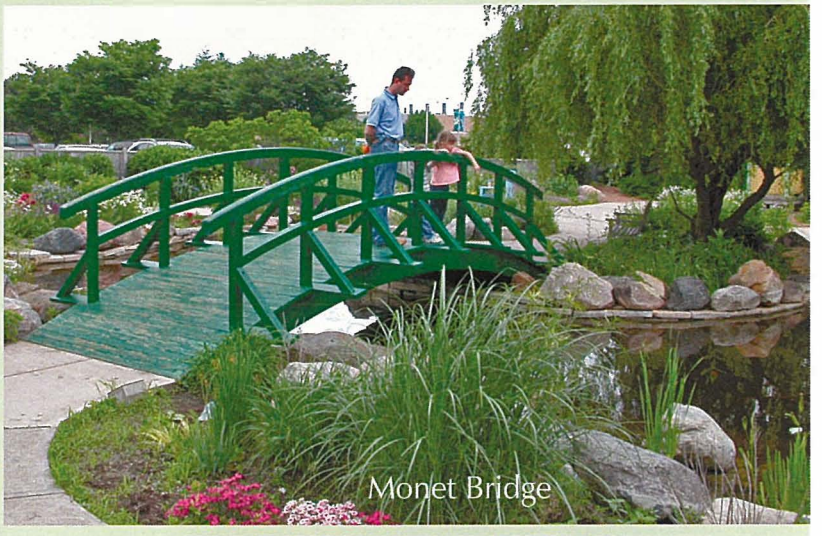
Rose garden

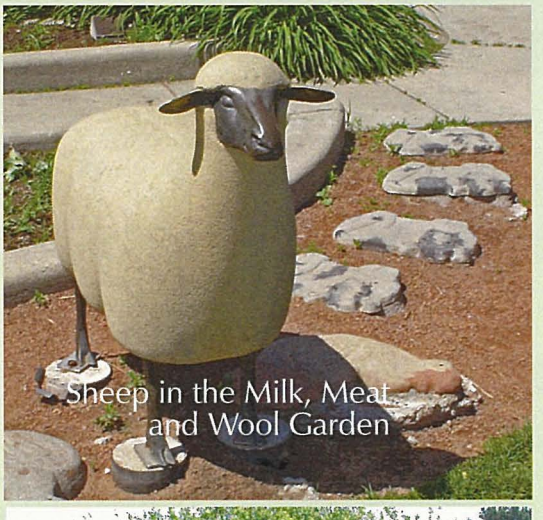
Annual Garden

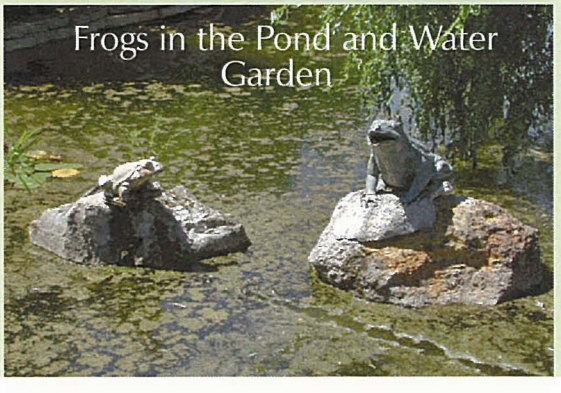
The Michigan 4-H Children's Garden


Reading to children

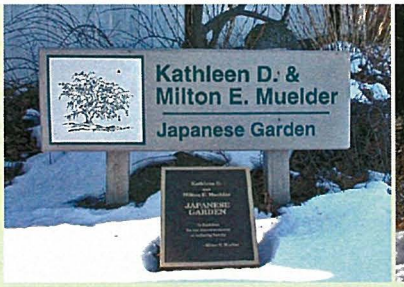

Swiss House from Monet Bridge

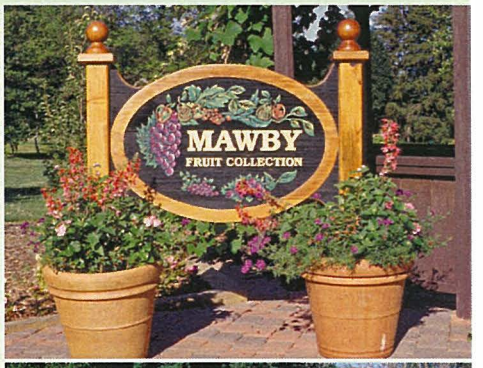

Monet Bridge

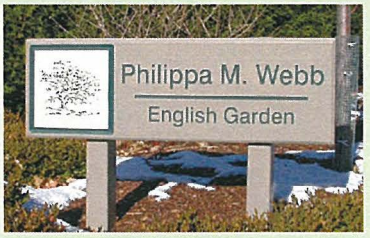

Sheep in the Milk, Meat and Wool Garden

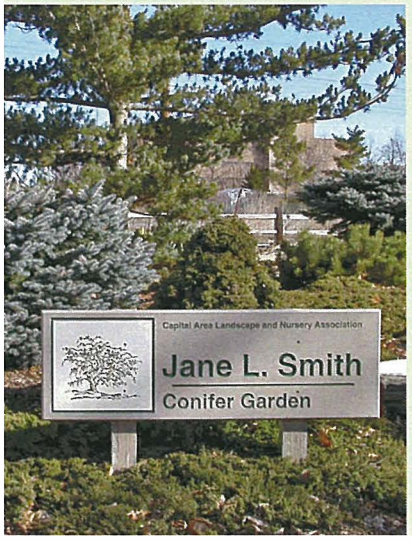

Frogs in the Pond and Water Garden

Gardens of the Clarence E. Lewis Landscape Arboretum

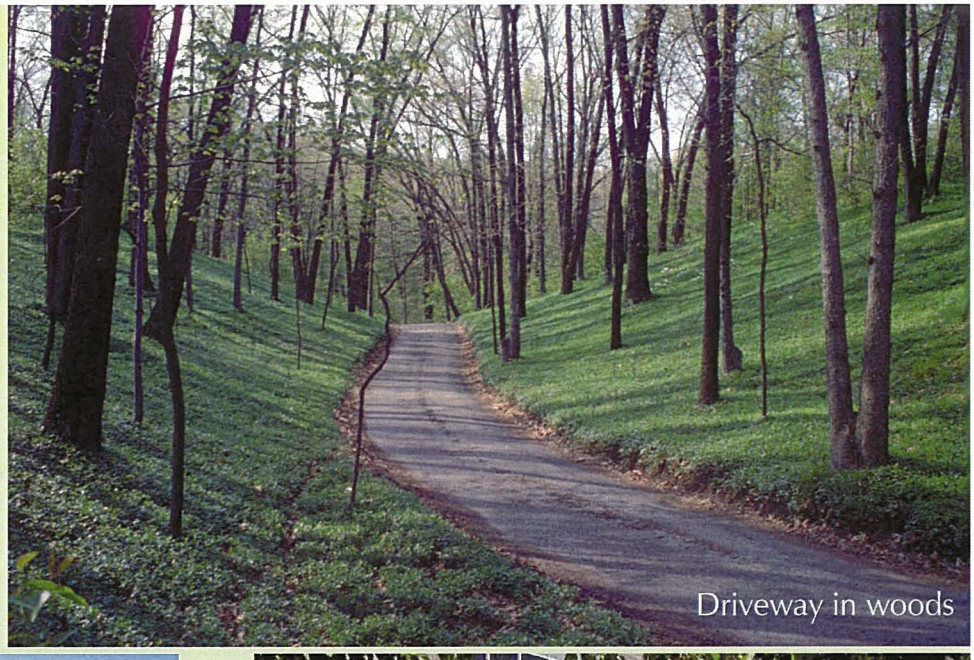


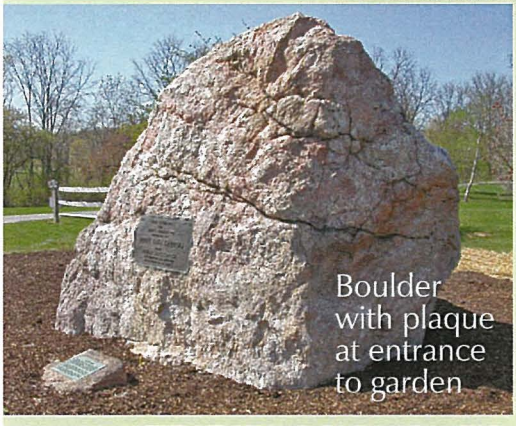




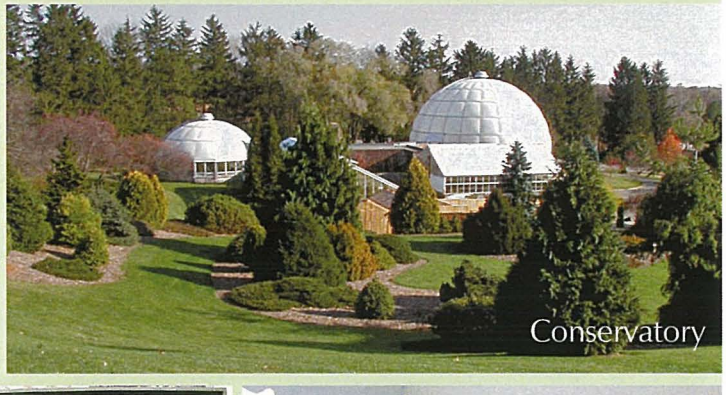


Hidden Lake Gardens

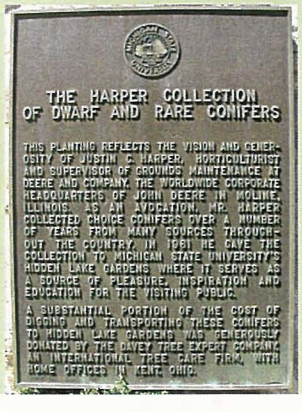

Driveway in woods

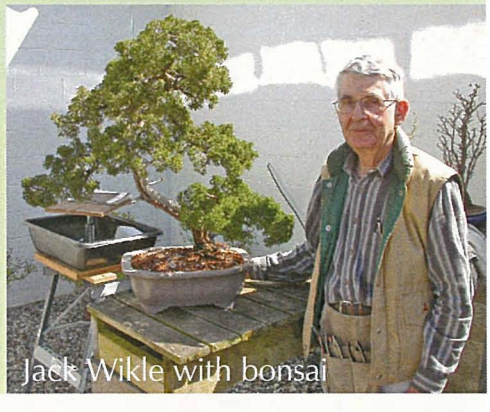

Boulder with plaque at entrance to garden


Visitor center


Conservatory


Dwarf conifers in Harper collection




Jack Wikle with bonsai

Chapter 7

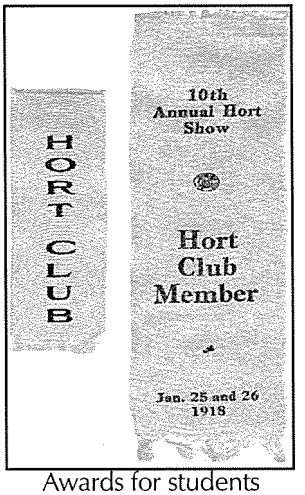
Fun and Fellowship - Student Organizations

Horticulture Club

The first student Horticulture Club at Michigan Agricultural College was organized in 1901, with the goal of "gaining a better knowledge in practical, scientific horticulture, to provide diversion from the regular routine of work by bringing in outside speakers of horticultural reputation, and to foster the fraternal spirit between the teachers and students of the Horticulture Department." Emphasis was on pomology. Initially the students met every other Wednesday night around the "big Hort table" in the reading room of the Hort Lab, but these were so well attended that meetings were held every week. One of the changes in the Horticulture Lab in 1905 provided the Club with a new meeting room.

Meetings were of a "practical nature," with speakers emphasizing fruit growing and floriculture, and various fruits were available for inspection. The Club sponsored field trips to growers' orchards at which "The orchard is inspected, dinner cooked over a bonfire, each one eats all the apples he can, and then fills his pockets." (Wolverine, 1911, p. 187)

Beginning in 1908, annual shows in the Agriculture Hall pavilion featured invited speakers, major displays of flowers and fruits, and awards for the best plates of fruit and the best 5-minute speech. Major interest remained pomology, with many plates of apple cultivars on display. Prizes were awarded for a number of displays, such as the "best plate of apples of the R. I. Greening group." The awards, supplied by the Michigan State Horticultural Society, as well as out-of-state companies, included hand-operated sprayers, orchard chemicals, and nursery stock, as well as cash. The Club also had banquets at the end of the spring semester with addresses by faculty. By 1917, club members were competing in fruit judging and identification contests sponsored by the Horticultural Society at its annual meeting in Grand Rapids.



Awards for students

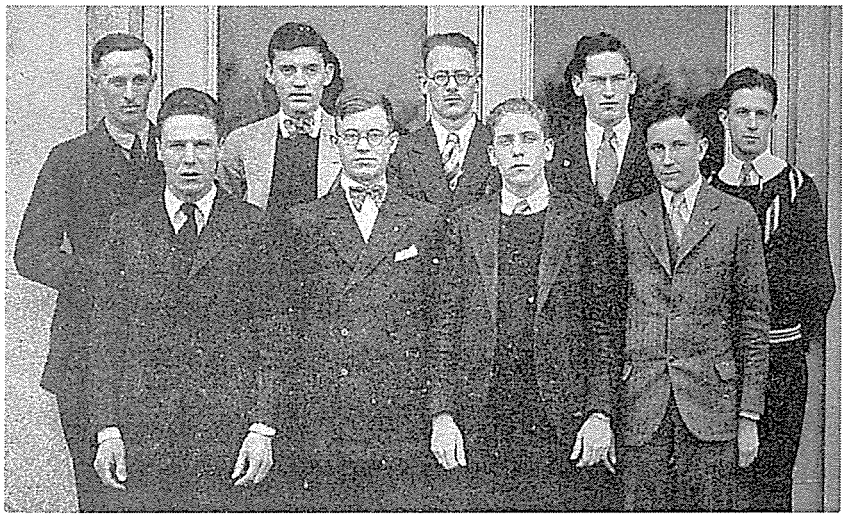
Club members included **Everett Claudius Yates '16** and **Delbert McCulloch Prillerman** ('17), who were among the first African-American students to complete bachelor's degree at MAC. Yates played in the cadet band and the orchestra while a student. Following graduation he taught at Tennessee Agricultural and Industrial State Normal School, which later became Tennessee State University, and at a public elementary school in Boston, earning an M. E. from Boston Teachers College in 1931. Prillerman served in WWI and subsequently returned to his home state of W. Virginia, where he taught at the Colored Institute in Bluefield.

In 1921, the show had expanded to include exhibits on citrus fruits, potatoes, nuts, ornithology, and entomology/plant pathology. By 1924 the Club had grown to 25 seniors and 23 juniors, in addition to 8 faculty members. By 1941, club members were managing part of the College orchard and selling apples in the Horticulture Building.

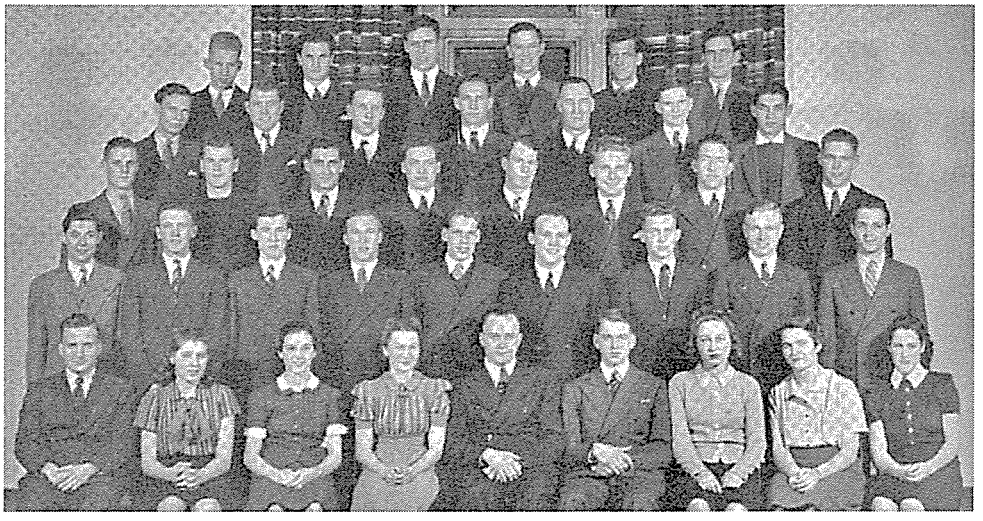
In 1947 the Club was reorganized into component commodity groups or forums (floriculture, pomology, vegetable crops and landscape management) that met together from time to time.

Pomology students joined forces with olericulture (vegetable crops) students to form the Pomoler Club in 1959. They raised money for field trips by selling apples in vending machines in the Horticulture and Student Services Buildings, using the funds to support field trips both in and out of state; to Florida and Virginia in 1969 with club advisors **George Kessler and Jerry Hull**, and Florida in 1970 and 1972, with advisor **Frank Dennis**.


Horticulture Club Show in Agriculture Hall, 1918

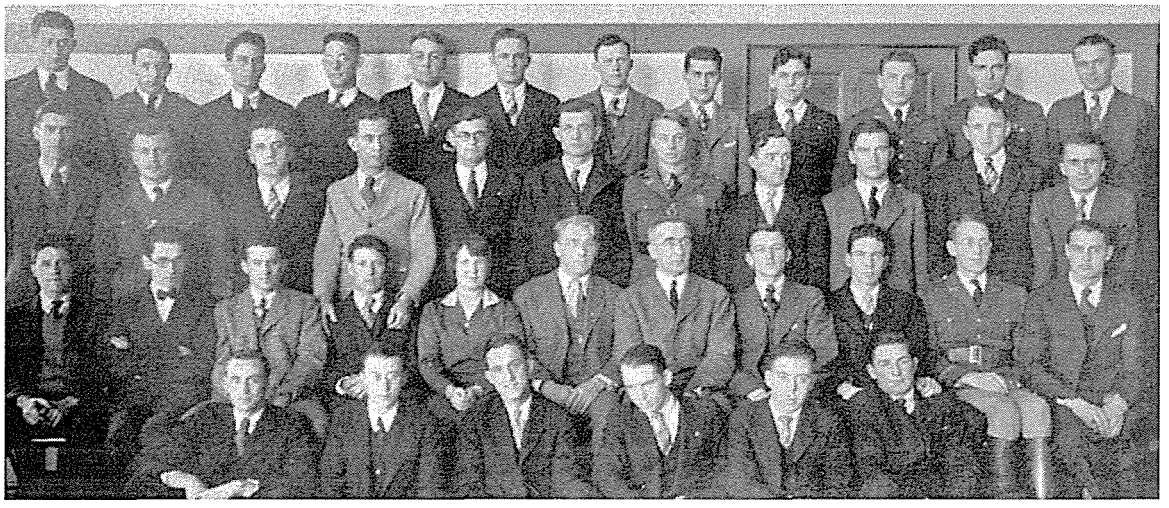


Horticulture Club 1929. *Front row, left to right*: H. F. Chickering, L. K. Cheney, W. A. Simonton, L. A. Zillman.
Back row: R. Eggert, G. H. Poesch, H. H. Hoadley, C. C. Mullett, I. Klein.

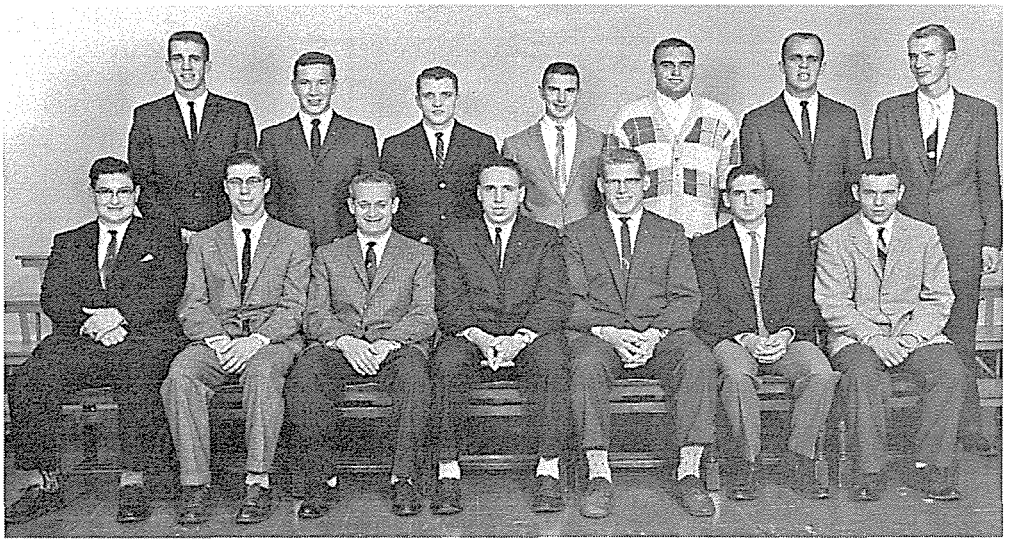


Horticulture Club 1940. *Front row:* C. Glotzhober, K. Colthorp, B. Gaige, A. Pickford, J. Osborne, R. Button, R. Baker, F. Elliott, M. Tait. *2nd row:* R. Wagner, A. Schlutow, G. Adler, W. Vondrasek, F. Simaton, T. Anderson, V. Beuschel, B. Lull, H. Clupper. *3rd row:* D. Smith, W. Schirra, J. Vucich, J. Schultz, F. Holtz, A. Lane, J. Friday, W. Case. *4th row:* L. Gardner, L. Swartz, E. Rosinski, V. Woodrick, O. Brown, N. Linderman, A. Isbit. *Top row:* V. Friday, P. Ehmann, S. McRae, J. Vaydik, C. Boomer, H. Besemer.

Pomology Forum 1952. 1st row: D. M. Hill, Prof. A. E. Mitchell, Prof. H. A. Cardinell, J. Hull, Prof. C. E. Russell, Prof. A. L. Kenworthy, R. W. Scheffler, F. J. Riley. *2nd row:* M. F. Taylor, L. A. Mitterling, J. P. Roth, F. F. Brunner, R. W. Bristol, A. F. Olson, G. M. Robinson, D. W. Kretchman, J. G. Spencer, M. A. Scott. *3rd row:* D. W. Bartz, D. M. Wickham, C. A. Schaefer, D. A. Wolfe, D. V. Sweet, R. L. Mawby, G. A. McManus.

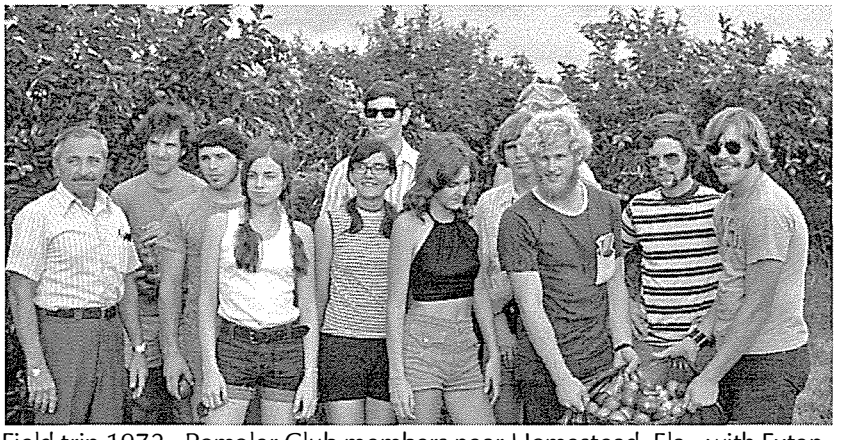


Landscape Club 1930. *1st row:* Cook, Mason, Rogers, Robertson, P. Palmer, Oswalt. *2nd row:* Devoodgt, Smith, Mott, Howell, Lancaster, Pesonen, Prof. Halligan, Brownell, Lawrence, Evans, Ahrens. *3rd row:* Howard, Zaetsch, Meldrum, Replogle, Vogt, Ackley, Hitchcock, Frost, Tindall, Strong, Johnson. *4th row:* C. Palmer, Martin, Forbes, Mandigo, L. Smith, Gregg, Dowd, Ferris, Yanz, Seeley, Davenport, Stenberg.

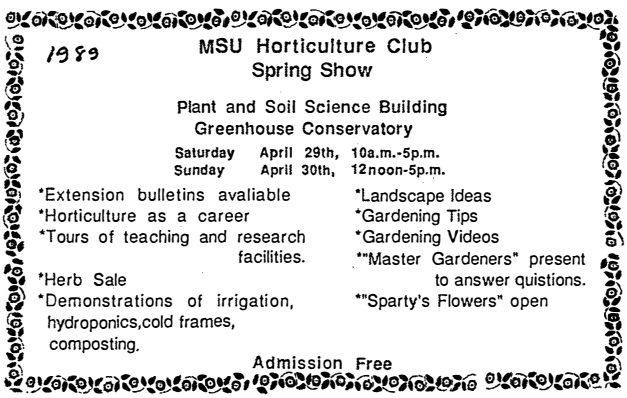


Pomoler Club 1962. *Front row:* D. Babbitt, P. Simon, Prof. G. Kessler, R. Schueneman, D. Nugent, P. Eggleston, N. Kreitner. *Back row:* D. Van Singel, J. Nye, Wm. Austin, B. Dowd, D. Harris, S. Van Singel, P. Friday.

Pomoler Club members Bruce Fox (*left*) and James Nugent (*right*) with the Club's apple machine, about 1969.



Field trip 1972. Pomoler Club members near Homestead, Fla., with Extension Agent Seymour Goldweber (*far left*).



Advertisement for 1989 Show

Program for 2000 Show

Spring Show 1989

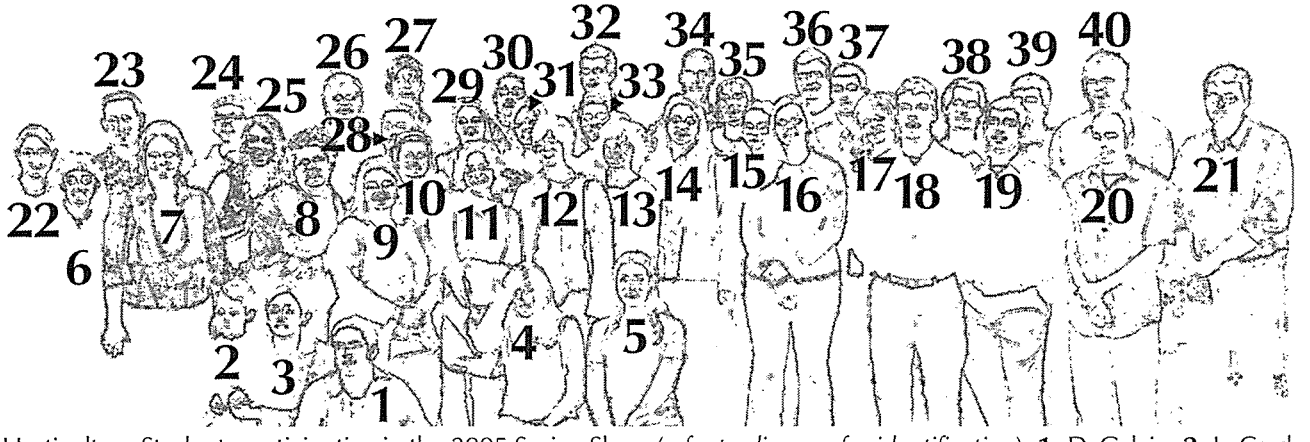
Spring Show 2004

Spring Show 2005

In the 1970s landscape students became members of the Pomoler Club, which was renamed the Horticulture Club. Later, 4-year floriculture students became members of the club, thus broadening membership to all categories of horticulture.

In April 1981 the Club joined with Horticulture students at other universities in the Mid-American Collegiate Horticultural Society (MACHS) at a convention at the University of Wisconsin; they also attended a meeting of the Association of Landscape Contractors of America (ALCA) in Milwaukee. By 1987-88 the Club had joined the Association of Collegiate Branches (ACB) of the ASHS and begun sending representatives to its annual meetings.

In 1989 the Club sponsored the first of a new series of annual spring shows held in the Conservatory, which was converted into a garden, renewing an activity that had ceased sometime in the 1920s. These have been held each year since 1989. They feature various garden arrangements of interest to the public, and plant sales have became a major source of income to finance field trips. In addition to displays of annuals, perennials, and other landscape plants, lectures by faculty members and other specialists provide information on many topics of interest to the home gardener.



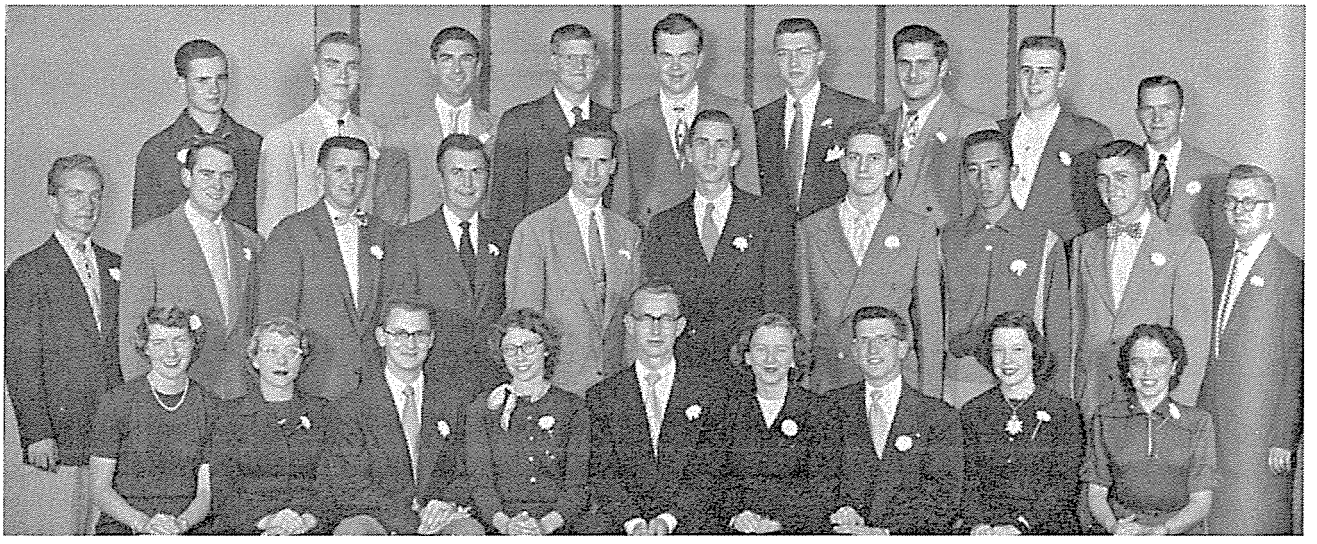
Horticulture Students participating in the 2005 Spring Show (*refer to diagram for identification*): **1-** D. Galvin, **2-** L. Card, **3-** J. Card, **4-** S. Russoy, **5-** N. Haut, **6-** ?, **7-** L. Shaver, **8-** A. Fink, **9-** H. Grodi, **10-** A. Russell, **11-** R. Garabedian, **12-** M. Orta, **13-** R. Perlove, **14-** A. Arend, **15-** C. Franz, **16-** L. Hall, **17-** J. Arnold, **18-** P. Lalonde, **19-** D. Hopp, **20-** M. Duck, advisor, **21-** Dr. R. Warner, advisor, **22-** J. Wielfaert, **23-** Dr. Erik Runkle, advisor, **24-** J. Roggenbuck, **25-** A. Moerdyk, **26-** J. Vandenberg, **27-** R. Tien, **28-** M. Ross, **29-** J. Anderson, **30-** J. Gerst, **31-** A. Hornbacher, **32-** A. DeGraaf, **33-** J. Eastman, **34-** A. Bingham, **35-** B. Attermeier, **36-** C. Allen, **37-** J. Fitzsimmons, **38-** O. Platt, **39-** C. Veley, **40-** M. Witte.

Floriculture Forum

The Floriculture Forum held flower shows as early as the 1950s. Its purpose, as stated in 1961, was to "promote a general interest in floriculture by presenting current developments in the field and developing contacts with prominent men in the industry." (This was prior to the era of women's liberation, even though 7 of the 16 members pictured in that year's *Wolverine* were females.) The Forum included both 2-year Agricultural Technology and 4-year students, and served as a means of gaining more experience and raising money for field trips. It performed many of the retail functions that Sparty's Flower Shop (see below) later took over. Forum members took all-day field trips, often visiting florist operations around the State. In the 1970s and 80s, the Forum sponsored very elaborate bridal shows, featuring floral designs and members modeling the latest in bridal wear.

A major money-making project was selling chrysanthemums at football games. Block Ss made of green pipe cleaners were affixed to the large white flowers. The prime spot for selling was on the end of the bridge near the stadium. On Valentine's Day, members sold roses at the Union.

All floriculture students were required to attend the spring convention of the Michigan Floral Association in Dearborn the first week in March, staying at the Dearborn Hyatt. The group brought flowers with them to compete against students from other colleges in the design contest, and to prepare corsages to sell for the banquet. They served on committees with professional



Floriculture Forum 1952. *1st row:* D. J. Andersen, J. E. Weber, J. C. Saylor, J. Baum, A. F. Preuss, J. J. Higbee, D. A. Dunbar, B. J. Billingsly, M. H. Rakestraw. *2nd row:* T. E. Weber, R.W. Akans, A. F. Hafner, M. M. Schuman, R. F. Hanna, G. B. Koths, S. R. Bienick, D. Awai, J. P. Clasper, J. E. Embling. *3rd row:* D. D Betterly, M. F. Rogers, D. W. Ousterhout, C. A. Crownover, L. M. Nieman, R. W. Berninger, D. S. Sochocki, F. D. Clark, R. G. Richardson.

Floriculture Forum 1961. Seated, *left to right*: Prof. R. R. Lindstrom (Advisor), G. Jensen, W. Tezal, C. Ciaramito, N. Quarry, Prof. W. Haney. Standing, *Middle row:* J. Miller, J. Hara, K. Gammil, J. Beal, M. Simmons, J. Johnson. *Back row:* W. Gude, J. Soukal, R. Flipse, N. Edge, D. Buckley, P. Beach.

florists, gaining experience in design and working behind the scenes of the convention. Many students maintained these contacts, and some were even offered permanent jobs by the florists for whom they worked .

Four-year students also participated in flower judging trips to Smith Floral and Greenhouse in Lansing , where instructors selected both plants and cut flowers for judging. Students trained for an entire semester and were offered one academic credit for the experience. The training culminated in the National Flower Judging and Floral Design Contest, where they would compete against 20 or more teams from other universities around the country. Trips were taken to such states as Texas, California, Colorado, New Mexico, and Wisconsin. To cover travel expenses, students asked for industry donations and conducted flower sales. When MSU hosted the national contest in 1989, one of the highlights was the field trip taken to the world headquarters of FTD, in Southfield.

Prof. Fails with MSU flower judging team, 1993

MSU team at spring MTA meeting , 1994

Sparty's Flower Shop

No provision was made for a flower shop in the new Plant and Soil Sciences building, but **Barbara Fails** recognized the potential for such an addition as a locus for training floriculture students in retail store management, and asked Dr. **Kelly** for permission to establish one. He approved, and in 1987 the agricultural technology floriculture students designed, built, and ran the store, which was located in a classroom on the ground floor of the building near the northeastern entrance. A display window and a sink were installed, the display cooler from the old Horticulture Building was moved in, and the students were in business.


Prof. Fails with student in flower arranging class

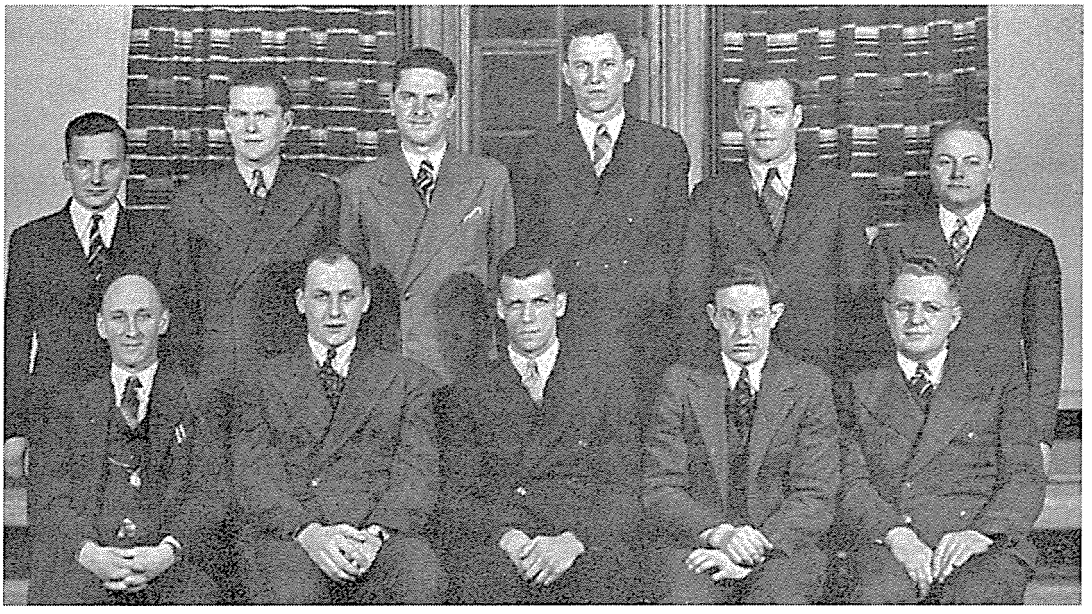
Four students – **Nancy Cramer, Tracy Wineland, Jared Spar and Theresa Whitley** – took on the whole project for the semester. To raise initial funds, left-over items in the old storage room were spruced up and sold, and benches were recycled from the old Horticulture Building. Plants from the greenhouse instructional programs were also marketed through the new store, which was open only in the afternoon.


Lab assistant Tim Latimer

Students not only operated the store during the day, but spent many hours preparing bouquets and corsages for special events, such as weddings, Valentine's Day, and Mother's Day. They were assisted by Fails and by **Tim Latimer,** a fresh MSU graduate himself, who had been hired to assist with the program part-time. Together, the group handled all the business operations, including advertising, product development, pricing, display, customer relations and sales, product buying and processing, accounting and asset management. Students were thus involved in all aspects of launching a new business and had an opportunity to learn business skills first-hand. Tim became a full-time manager the second year, when revenues were able to cover his salary.

A major impediment to the success of the store was the absence of nearby parking space. In 1991, thanks to a generous gift from **Pauline Glassbrook**, Sparty's was moved to the greenhouse area on the east side of the building to improve customer access. This involved the conversion of what had been the soil storage area to the new store. Windows and an outside door were installed, and three parking spaces in front were reserved for customer use. Tim Latimer and Greenhouse and Garden Supervisor **Doug Badgero** built the sales area using barn wood donated by Badgero's grandparents. Students in the Ag Tech Commercial Floriculture program continued to manage the store as part of their curriculum until the program was terminated in 1998.

At that time the shop's function changed from supporting the instructional program to providing visitor services for the MSU Horticulture Gardens, and was managed by the garden staff. The store remained in operation as Sparty's Flowers until 2004, when the name was changed to the Visitor Center.



Pi Alpha Xi, 1939. Front row: *left to right*: Prof. C. Wildon, G. MacQueen, C. Boomer, J. Belleau, Prof. P. Krone. Back row: C. Glotzhober, P. Bowser, E. Roberts, J. Vaydik, W. Holley, G. Perkins

Pi Alpha Xi

Pi Alpha Xi was created as a national floriculture honorary for male students majoring in horticulture. Delta chapter was organized at MSC in 1928; membership was open to both graduate and undergraduate students, as well as faculty members. Profs. **Krone** and **Wildon** served as advisors, and members met once a month to hear talks by professional florists and to plan judging contests. Members designed flower shows and garden scenes for Farmers' Week, and sent flower judging teams to the national flower shows. The chapter was discontinued sometime in the mid 1960s.

Horticulture Organization of Graduate Students (HOGS)

HOGS (acronym intended) was organized by the graduate students in the Department in the late 1960s, with **Robert Stebbins** as president. Its purpose was to improve graduate student relations with faculty and other students in the Department. Throughout the years, HOGS has organized many activities, both social and academic.

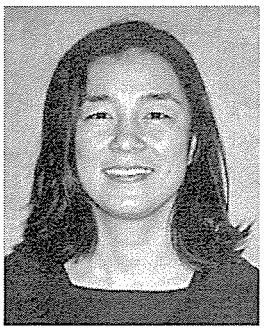
These include a fall orientation for new graduate students, travel and degree completion grants, an international dinner, a plant science graduate student research symposium, annual Halloween and other holiday parties, and an annual ski trip. HOGS has also hosted and funded a seminar speaker for the Department's seminar series. Representatives of HOGS have served on numerous search committees for Departmental chairpersons and faculty positions, assisted with planning departmental events, and helped coordinate transportation to ASHS meetings.

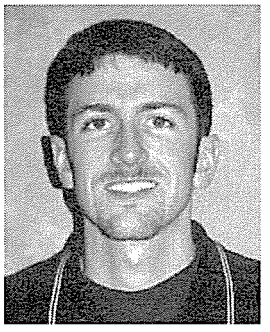
Several fundraising events have been held, including sales of T-shirts, sweatshirts, potted plants and ornamental grasses during the Horticulture Club's annual spring show.

Since 1989, students serving as president have included **Nathan Lange** (1989), **Anusuya Rangarajan** and **Sue Kann** (1990), **Mark Yelanich** and **James Faust** (1991), **John Neilsen** (1993), **Cathy Whitman** and **Cheryl Hamaker** (1994), **Erik Runkle** (1995), **Rufino Perez** (1996), **Leonardo Lombardini** (1997), **Sarah Breitkreutz** (1998), **Mohamed Tawfik** (1999), **Amy Enfield** and **Charlie Rohwer** (2001), **Liz Monroe and Lee Ann Pramuk** (2002), **Angie Durhman** (2003), **Erin Hill** and **Roberto Lopez** (2004), and **Matthew Blanchard** and **Roberto Lopez** (2005).

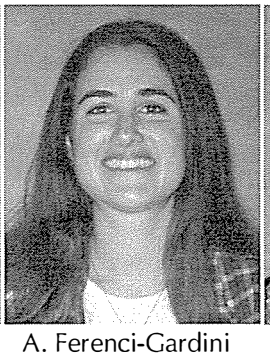
Horticulture Graduate Students

2005


K. Ando

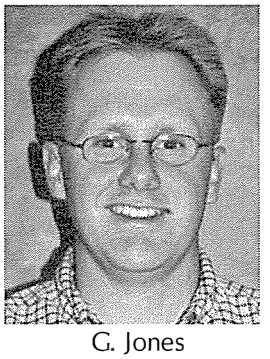

M. Blanchard

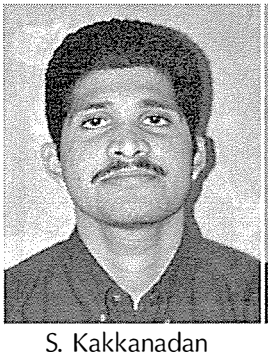

C. Drake


A. Ferenci-Gardini

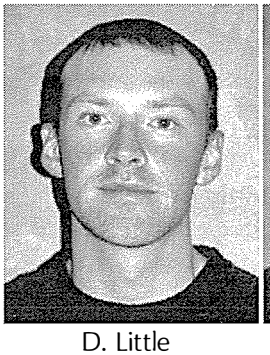

K. Getter


E. Hill


G. Jones


S. Kakkanadan


M. Lenz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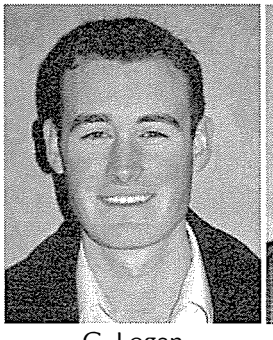
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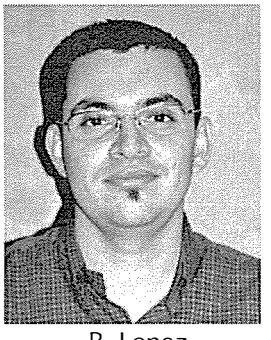
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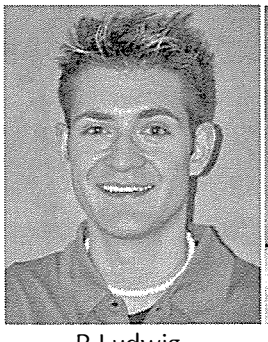
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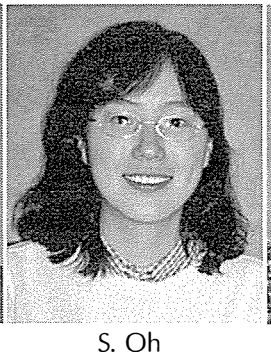
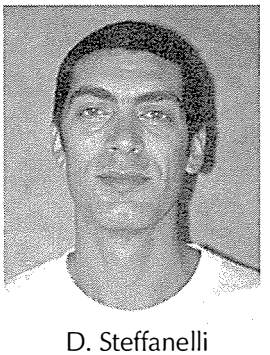

S. Oh


J. Olmstead


S. Padhye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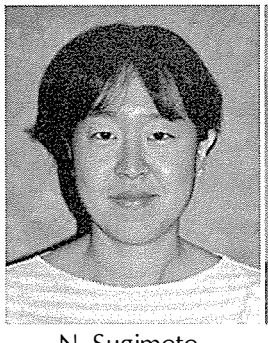
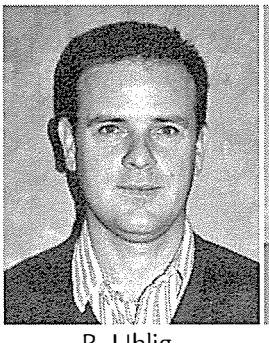

N. Sugimoto


L. Sun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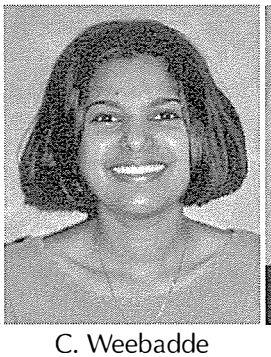
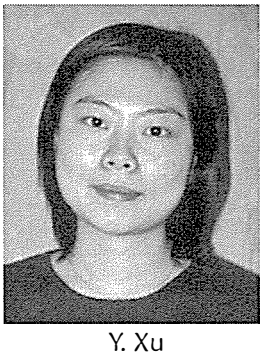

C. Weebadde


Y. Xu

Chapter 8

International Aspects

Horticulture faculty members have been involved in overseas projects since at least the mid-1940s, when **Horace A. Cardinell**, who had previously (1918-20) served as pomologist with the Brazilian Government, worked with the Office of Inter-American Affairs at the Agricultural University of Brazil. He returned in 1953-54 on a USDA assignment with the University of Brazil. **F. L. S. (Steve) O'Rourke** also spent considerable time on foreign assignments, including work on the Point 4 program in Ecuador in 1952-55 and 2 years with the International Cooperation Administration as advisor to the Thai government in 1956-58.

H. B. Tukey was one of the founding members of the International Society for Horticultural Science in 1959 and served as president from 1962 to 1966. A world traveler who had many contacts abroad, he presented numerous papers at international meetings, and was responsible for bringing many scientists to the United States as visitors. In addition, he was technical advisor to the U.S. delegation to the international conference in Geneva, Switzerland, on peacetime uses of atomic energy, and consultant to an eight-man survey team for the Atomic Energy Commission in southeast Asia in 1956 and in Puerto Rico in 1957. His awards included an honorary doctorate from the University of Hanover.

Faculty members have served as consultants on many projects in other countries, e.g., **Robert Carolus** in Nigeria and **Sylvan Wittwer** in the Soviet Union and elsewhere, and have traveled extensively on sabbatical leaves and on assignments as visiting professors. Followimg WW II, Okinawa became a major base for the U.S. military. A new land grant-type university -- the University of the Ryukyus -- was established jointly by the U.S. Department of the Army and the American Council on Education, with Michigan State as the mentor institution. The University opened its doors on May 22, 1950. Many MSU faculty members helped Okinawans develop programs in agriculture and other fields; **Robert Carlson** served there in 1956-58. When the Ryukyus were returned to Japanese control, the University became one of the national universities of Japan. (Dressel, 1987, p. 277)

Carlson was instrumental in organizing the Dwarf Fruit Tree Association, which was formed by extension personnel and growers to exchange information regarding management of dwarfing and semi-dwarfing rootstocks. Starting in 1958 with only about six growers and researchers meeting in an apple storage, this grew to become the International Dwarf Fruit Tree Association (IDFTA) with members from around the world. Carlson served as secretary for 28 years (1958-1985), organizing annual meetings and tours in the United States, and national and international study tours in Europe, Asia, South America, Southern Africa, Russia, and Oceana; in 1991 he was awarded the Veitch Memorial Medal by the Royal Horticultural Society.

Carlson continued to serve as secretary of the IDFTA for several years following his retirement. In 1986 **Ronald Perry** succeeded him as secretary, and continued organizing meetings and tours until 1989, when **Howard (Jack) Rollins** of Virginia Polytechnic Institute became secretary.

Speakers at 2nd meeting of the IDFTA at Hartford, Mich. in March 1959. Seated, left to right: Raymond Klackle, grower/processor, Belding, Mich.; Dr. Tony Preston, East Malling Research Station, England; Dr. H.B. Tukey, MSU. Standing: Rufus Prince, Maine; Dr. Alex Hutchinson, Vineland Horticultural Research Station, Ontario; Canada; Paul Stark Sr., Stark Brothers Nursery, Louisiana, Missouri.

Sylvan Wittwer had many graduate students and post-docs from abroad, who worked with him in projects dealing with the use of growth regulators and of radioactive isotopes in foliar absorption of radionuclides. During his career, he traveled extensively, presented many papers at international conferences, and led more than 70 research missions and tours abroad, as well as serving as advisor/consultant on nu-

merous committees and councils dealing with food production and research, both in the U.S. and abroad. The list includes assignments in Taiwan, the Peoples' Republic of China (PRC), Korea, Bangladesh, the Soviet Union, Kuwait, Taiwan, India, Egypt, Israel, and Japan. He was elected as one of only two U.S. members of the V. I. Lenin All Union Academy of Agricultural Sciences. In 1981 he was invited to visit agricultural research institutes and universities in the PRC. This led to publication of the book, co-authored with three scientists from the PRC, *Feeding a Billion*, which describes how that country copes with feeding its huge population, and has been described as the most complete document on Chinese agriculture in the English language.

John Bukovac has also been heavily involved in international activities. He worked with isotopes both as a graduate student and later as a faculty member. This led to an invitation from UNESCO to present lectures on autoradiography at a school in Japan on the peaceful uses of radioisotopes. While in Japan he met Drs. **Sumiki** and **Yabuta**, Professors of Agricultural Chemistry at the University of Tokyo, who had done much of the early work on the isolation and chemical structures of the gibberellins. Interaction with scientists in this laboratory provided the basis for subsequent work by **Wittwer** and Bukovac, together with visiting scientists from Japan, on the effects of gibberellins on the growth and development of horticultural plants (see research section).

During a sabbatical at Oxford, Bukovac established a working relationship with English colleagues to investigate the role of the cuticle in penetration of growth regulating compounds and other chemicals into plants. Subsequently, a cooperative relationship was established with **Victor Valpuesta** at the University of Malaga in Spain, and with scientists in Germany. The latter led to his being awarded both an honorary doctorate from the University of Bonn, and the von Humboldt prize, which provided support for an extended period of research at Bonn. In 2005, although officially "retired," Bukovac was involved in a joint project with **Moritz Knoche,** a former post-doc in John's laboratory, at the University of Halle in Germany. Other international awards include the Veitch Memorial Medal (see Carlson, above), and the Spiridion Brusina Medal from the Croatian Society of Natural Sciences.

In 1981 **Harry "Skip" Bittenbender** (Ph.D '77), joined the staff as the first full-time international horticulturist. He had had extensive experience in the Philippines and in Nepal as a graduate student, and initiated courses in tropical fruits and tropical vegetables for undergraduates. He also recruited graduate students from developing countries, who worked on projects relevant to small farm agriculture. More recently, study-abroad programs have been established with the Escuela de Agricultura para la Region Tropico y Humido (E.A.R.T.H.) in Costa Rica (**Irvin Widders** – see below), with the University of Talca in Chile (**Robert Herner** and **James Hancock**), and with Wageningen University in the Netherlands, together with several botanical and private gardens in England (**Brad Rowe** and **Tom Fernandez**). Irvin Widders also coordinates a winter break study-abroad program in Cuzco, Peru.

Students and faculty in Trompenberg Botanical Garden, Netherlands, during Overseas Study trip in 2002. *Back row, left to right:* Matt Steinkopf, Chrissy Gajewski, Dr. Arthur Cameron, Dr. Tom Fernandez, Laura Emrick, Alicia Wells, Jean Vandenberg, Dr. Bridget Behe. *Front row:* Jan Russell, Stacy Sanborn, Heather DeRuiter, Emily Stefanski, Roberto Lopez, Nick VanWoert. *Kneeling:* Nick Botden, Dr. Brad Rowe.

Amy **Iezzoni**'s research included cooperation with cherry breeders in Eastern Europe, who supplied seeds from controlled crosses so that the resulting seedlings could be evaluated for commercial use in Michigan (see research section).

MSU signed a cooperative agreement with USAID on Agricultural Biotechnology for Sustainable Productivity. This included a sub-project directed by **Rebecca Grumet** for developing transgenic virus-resistant cucurbits for developing countries.

Frank Dennis's interest in international agriculture was sparked by a postdoctoral fellowship in France in 1961-2. His main international commitment was made at the International Society for Horticultural Science (ISHS) Congress at Hamburg in 1982. There a group of horticulturists formed the nucleus of what became an ISHS Working Group on Temperate Zone Fruits in the Tropics and Subtropics, with Dennis as chair. The goal was to bring together growers and scientists working with

species that normally require chilling temperatures to break dormancy, but can be forced to bloom by cultural practices or the use of low-chilling genotypes. The first workshop was held in conjunction with the 10th African I.S.H.S. Symposium in Addis Ababa, Ethiopia, in January 1984 and the first independent workshop in Cagua, Venezuela in 1985. Subsequent workshops have been held at approximately 2-year intervals.

Robert Herner spent a year and a half at the University of Harare in Zimbabwe in 1985-86, together with professors from several other U.S. universities. Their task was to establish a curriculum in agriculture, as most of the courses offered at that time were in the arts and sciences. Herner was responsible for the horticulture curriculum, taught several courses, worked with small farmers, and conducted some research projects with commercial growers. Following his return to MSU, he served as advisor for several M.S. candidates from Zimbabwe.

Bean Cowpea Collaborative Research Support Program (BC-CRSP). **Irvin Widders** got an early start in international agriculture. He worked for 3 years with the Mennonite Central Committee advising a cooperative of vegetable farmers on improved production practices in Honduras, and subsequently coordinated a community development program including 15 communities there – all before starting college. He joined the Horticulture faculty on completing a Ph.D. at the University of California-Davis in 1991. During a sabbatical leave at EARTH University in Costa Rica in 1994, he set up a study abroad program for MSU students. In 1998 he assumed a half-time position as Deputy Director of the BC-CRSP, and became full-time Director in 2000.

The B-C CRSP, for which MSU is the Management Entity, is a USAID-funded program involving a consortium of 11 U.S. universities, and more than 25 agricultural research systems and universities in Latin America, the Caribbean, and Africa. **Sieglinde Snapp** and numerous faculty in the Department of Crop and Soil Sciences have participated in the program The global objective is to improve bean/cowpea production and consumption through collaborative multi-disciplinary research and training in economics, marketing, food science, agronomy, genetic improvement, and human nutrition, with the aim of contributing to food and nutritional security and economic growth in developing countries and the U.S.

Such programs enable MSU faculty to participate in collaborative projects with scientists around the world on cutting-edge research, to bring in international students for M.S. and Ph.D. degree programs, and to gain international experience and knowledge that they can use in the classroom.

Chapter 9

Summary and Future Challenges

The Department of Horticulture has much to be proud of as it looks back on 150 years of teaching, research, and extension. It has awarded degrees to an estimated 5000 to 6000 undergraduates and 1000 graduate students, kept abreast of research in both practical horticulture and the basic research that undergirds it, contributed much useful information to Michigan producers of horticultural crops, as well as to amateur horticulturists, and has become one of the outstanding horticulture departments in the United States and the world.

When MAC was founded in 1855, students had little choice as to the courses they took or the way they were taught – mostly lectures, with few textbooks. Only two horticulture courses were offered in 1870, one for sophomores and one for seniors. All students were required to work with plants and animals as they helped clear the land and establish the gardens and orchards that would serve as laboratories for the students who followed. The horticulture curriculum soon began to grow and diversify, as did Michigan horticulture itself. From early emphasis on pomology, and to a lesser extent, vegetable crops, the range of courses broadened to include floriculture and landscape horticulture, thus keeping pace with the changing focus of the industry. This breadth was evident in 2005. Total cash receipts in Michigan were $ 650 million for floriculture and nursery crops, $ 276 million for fruits, and $ 350 million for vegetables. Inclusion of landscape services brought the total to over $ 1.5 billion.

Over the years, the student population has changed, with fewer coming from farm backgrounds or planning to farm themselves. Today, most seek training and employment in other horticultural areas, from extension and public gardens to landscape maintenance and sales of horticultural products. The need to provide practical experience, appropriate for each major in the Department, led to the internships now required of all students. Students' horticulture studies have also been broadened and diversified by programs in international studies.

As a land grant college, MAC had a responsibility not only to its enrolled students, but to the citizens of Michigan as a whole. Through the Farmers' Institutes, introduced in 1876, the College first "extended" its educational program to farmers and their wives. This role was expanded when the Michigan State legislature provided funds for farm advisors and on-farm demonstrations in 1909, and in 1914 when the Federal Smith-Lever Act created the Cooperative Extension Service. In addition, horticultural information has reached the public through radio and TV programs, the internet, and through programs such as Master Gardeners.

Initially, there was neither time nor money for research in horticulture, but farmers and faculty members soon raised questions that could be answered only by scientific investigation. The search for improved cultivars, begun in earnest under Prof. Beal in the 1870s, has continued to the present. Over the years, faculty members have made major contributions in cultivar improvement through breeding and selection of peach, cherry, cucumber, carrot, lettuce, cauliflower, pepper, and floriculture crops. The blueberry, once obtained only from the wild, was domesticated and has become a major source of income for Michigan growers on land good for little else. The introduction of new grape cultivars has revolutionized wine production for Michigan vintners. The development of cucumber cultivars for once-over harvest, together with cooperative research with agricultural engineers, resulted in an efficient system for harvesting pickling cucumbers by machine. In recent years, scientists have begun to explore molecular biology as a means of modifying plants, with the goal of improving characteristics such as yield, disease and pest resistance and cold hardiness. Although this work is promising, and now accounts for much of U.S. corn and soybean production, some consumers remain skeptical, and demand more tests of the safety and healthfulness of these and other products currently being developed. Few horticultural crops have been released for commercial use.

In another area of research, experiments with growth substances provided new methods for controlling weeds, thinning apples to increase fruit size, facilitating mechanical harvest of cherries, controlling growth of pot plants, and preventing sprouting of potatoes during storage. These advances have made production systems more efficient and viable. Better methods of irrigation were researched and introduced, as were methods of evaluating plant nutrient status and of recommending appropriate applications of fertilizer.

Experiments with bedding plants created a new industry for Michigan, contributing to the rise in value of floriculture crops from $ 8 million in 1966 to $ 350 million in 2001. Manipulation of environmental conditions during vernalization of biennials, bulb storage and forcing, and growth in the greenhouse, combined with graphical tracking to monitor development, provided the means for programming floral crops to bring them into bloom at the optimum time for sale. Improved storage procedures for apples extended the marketing period from fall to winter, and subsequently to a full year. Research with rootstocks and training systems for apple, cherry, and grape led to higher and earlier production, while simplifying management. Research on clarification of apple juice stimulated sales; test marketing of food products, using chestnuts, carrots, and flowers, may lead to new niche markets for these crops.

The search for better methods of disease and pest control is now shared by horticulturists, entomologists, and plant pathologists. Evaluation of chemicals for controlling apple scab was initiated at MAC in the 1880s, and experiments continued with fungicides and insecticides. Beginning in the 1970s the concept of "Integrated Pest Management," or IPM, was introduced by entomologists and plant pathologists. Sprays were no longer applied at predetermined intervals; instead, insects were monitored and temperature and rainfall recorded to determine when to spray. Later, Integrated Crop Management (ICM) was introduced to include many other aspects of production, such as the use of nutrients and cover crops. Current emphasis on ecology has led to the concepts of sustainable agriculture – reducing the environmental impact of agriculture by recycling, and organic agriculture -- the use of natural, rather than synthetic, fertilizers and pesticides. As a result, the Department is testing various methods of non-chemical weed control, and of organic apple production. Courses in organic horticulture are offered, and a Student Organic Farm has been established to provide hands-on experiences. New research programs on limiting pollution have paralleled the interest in these methods of growing crops. Studies of nutrient use in greenhouses showed that excessive levels were being used, and could be reduced with no loss in plant quality. Use of plants to remove pollutants from soil and water ("phytoremediation") is also being evaluated, and plants such as sedum are being tested to cool, and reduce runoff from, commercial buildings ("greenroofs").

From the founding of the College to the present, gardens have been important parts of the Department's teaching program as well as a contribution to the public. The gardens to the east of Old Horticulture were a drawing card for both professional and amateur gardeners, and the new gardens surrounding the Plant and Soil Sciences Building, including the innovative 4-H Children's Garden, continue this tradition. The Trial Gardens provide a source of information, not only for the public, but for seed producers who need feedback on new cultivars.

Major advances in technology, particularly the introduction of the computer, have been of use in classroom and laboratory, farm and nursery. For example, horticulture faculty members can record field data automatically, model plant growth, predict optimum time of sale, control greenhouse temperature, analyze complex molecules, classify cherry genotypes according to leaf characteristics, and perform otherwise difficult, and sometimes tedious, calculations. Also, the computer and internet facilitate the sharing of information with students, other scientists, and growers locally and worldwide. The Department's web sites provide access to all of its faculty and staff, and sharing of information on all aspects of horticulture. Even the very young may participate; in the 4-H Children's Garden, interactive computer connections now allow children to ask and find answers to questions, enhancing their experiences

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So much for the past. What does the future hold? As noted above, plant breeders at Michigan State have introduced many plants that are superior in yield, appearance, and disease and insect resistance. Although millions of acres of transgenic agronomic crops are currently being grown world-wide, work on horticultural crops has been limited, despite the fact that safe application holds promise for both the farmer and the consumer. Many objections have been raised to introducing genetically engineered plants for commercial use, including the acquisition of herbicide resistance in non-target plants, and damage to beneficial insects, but little or no reliable evidence exists for detrimental effects. Given its potential, further use of the technology is inevitable. Analysis of the plant genome (genomics) to reveal genes of special interest will be especially important for facilitating both traditional breeding and gene transfer.

A better understanding of genetics will also expand our knowledge of the physiology of plant growth and development. Learning how genes regulate flower and fruit development, fruit senescence, and resistance to drought, nutrient, salt, and temperature stresses will lead to better methods of controlling these processes.

Sustainable and organic agriculture will remain major areas of concern, involving use of fertilizers, whether organic or inorganic, and control of weeds, insects, and diseases. Research on ecologically sound

methods of crop production, such as ICM, use of cover-crops, phytoremediation and nutrient recycling, will continue to provide better ways of limiting pollution. Associated with these trends there will be an emphasis on the roles of horticultural products in human health.

Teaching and extension have benefited from the introduction of computers and of distance learning via the internet. The "virtual university" will continue to expand as faculty develop more programs and better methods, and arrangements are made with other institutions in Michigan, the United States, and the world. Many MSU departments, including Horticulture, have cooperative programs with scientists and educators in other countries. Given the difficulties that many nations in the developing world are facing in both feeding and educating their citizens, there will be many opportunities for expanding such programs. With an expected world population of 9 billion by 2050, agricultural production must increase by 50% or more if the world's population is to be adequately fed.

Globalization has affected grower options as to crops grown and methods of marketing them. Imports have reduced returns for apple juice to the Michigan farmer, and this trend will continue with other products. Michigan apple growers compete with producers in the Southern Hemisphere, where the fruit is being harvested when Michigan fruit is being removed from controlled atmosphere storage. This may reduce the profitability of such storage.

In contrast, agreements between Chilean and Michigan blueberry growers to market one another's fruit in the off-season have been beneficial for both groups. The current interest on reducing long-term transport of fruits and vegetables to save fuel has given a boost to local production and sale of such produce in Farmers' Markets -- a common method of sale in other countries.

These and other trends provide opportunities for faculty members, in concert with colleagues in other departments, to investigate what crops can best be grown in Michigan to provide maximum returns to the grower.

Courses must change as new information is generated and new problems arise. Graduates from traditional college programs can rarely solve the problems they face by using knowledge from one field alone. Educators now realize the benefits of interdisciplinary courses that provide a broader approach to the sciences. This applies to extension, as well. The Areas of Expertise (AoE) concept, which brings specialists from several disciplines together to work on issues, will continue to help solve grower problems. Despite difficulties in arranging cooperative agreements among states, this could expand to regional arrangements in the Midwest, given current limitations on funding for extension.

Funding has been and will continue to be a problem for horticulture and other university departments. Although state support has increased, it has not kept pace with inflation. Extension, in particular, has suffered. Publications that once were free now require payment, and services have been reduced. This could lead to a fee-for-service arrangement, as is practiced in some countries. Grants from government agencies and private companies have partially covered the loss, but this may not last. Furthermore, these sources inevitably direct the focus and content of research, resulting in some loss of control by the Department.

Although production of horticultural products continues to expand, the number of horticultural science departments in North America has declined some 35 % over the last 30 years, as horticulture, agronomy, and forestry departments have been consolidated to form plant science departments. The Department of Horticulture at MSU, with over 30 professors and strong commitments to all areas of horticulture, should remain one department for the foreseeable future, despite pressure on the University to limit expenditures.

Currently, Michigan's economy is affected by the decline of its primary industry, the manufacture of automobiles. A major challenge for the Horticulture Department is helping Michigan's second largest industry, agriculture, remain strong and competitive. To do this, it must not only "think local," but must have a long-term, world-wide, whole earth view.

Appendix 1

List of Department Heads/Chairs

In early years the Department of Horticulture was responsible for the campus plantings, including directing the students in their required practical work, but was not a true department in the modern sense. Albert Prentiss was the first Professor of Botany and Horticulture, but not until 1882 , when James Satterlee was apppointed Professor of Horticulture, did the Department become a separate entity. Horticulture was responsible for campus maintenance as well as instruction until the early 1900s.

1857 - 62	**John Clough Holmes**, Prof. of Horticulture
1860 - 63*	**George Thurber**, Prof. of Botany and Vegetable Physiology.
1863 - 69	**Albert Nelson Prentiss**, Prof. of Botany and Horticulture and Superintendent of the Gardens
1870 - 72	**Will Warner Tracy**, Prof. of Botany and Horticulture and Superintendent of the Gardens
1872 - 82	**William James Beal**, Prof. of Botany and Superintendent of the Horticulture Department (1872-75); Prof. of Botany and Horticulture and Curator of the Botanical Museum (1875-81)
1882 - 84	**James Satterlee**, Prof. of Horticulture and Superintendent of the Grounds
1885 - 88	**Liberty Hyde Bailey, Jr.**, Prof. of Horticulture and Landscape Gardening and Superintendent of the Horticulture Department, Horticulturist of the Experiment Station
1888 - 1902	**Levi Rawson Taft**, Prof. of Horticulture and Landscape Gardening and Superintendent of the Horticulture Department. Horticulturist of the Experiment Station (1888-1908)
1902 - 05	Ulysses **Prentiss Hedrick**, Prof. of Horticulture and Landscape Gardening and Superintendent of the Grounds
1905 - 08	**Stephenson Whitcomb Fletcher**, Prof. of Horticulture and Landscape Gardening
1908 - 19	**Harry Joshua Eustace**, Prof. of Horticulture and Vice-Director of the Experiment Station
1919 - 22	**Charles Parker Halligan**, Prof. of Horticulture and Landscape Gardening
1923 - 45	**Victor Ray Gardner**, Prof. of Horticulture; Director of the Agricultural Experiment Station (1929-1949)
1945 - 62	**Harold Bradford Tukey**, Prof. of Horticulture
1962 - 77	**Herman John Carew**, Prof. of Horticulture
1978 - 90	**John Francis Kelly**, Prof. of Horticulture
1990 - 2000	**Wayne H. Loescher**, Prof. of Horticulture
2000 - 02	**Ronald L. Perry**, Prof. of Horticulture and Acting Chair
2002 -	**Ronald L. Perry**, Prof. of Horticulture

* Holmes was responsible for care of the grounds, rather than instruction, thus the overlap with Thurber.

Appendix 2

Horticulture Faculty and Experiment Station Supervisors

Name	*	MSU Degrees	Appt	Asst	Assoc	Full	Resign	Retire	Notes
Aldrich, Willard W.			1950				1951		
Andersen, Robert L.		M64	1968	1968	1973	1978	1981		
Anderson, ____			1870						
Apple, Spencer B. Jr.	E		1942	1946			1946		
Asen, Sam			1950	1950			1954		
Babb, Myron F.			1929				1931		
Bailey, Liberty H. Jr.	Chair	B1882,M86	1885				1888		
Baker, Larry R.			1968	1968	1972	1978	1980		
Ballard, Clark			1956		1955		1959		
Barden, Floyd M.		B08	1916						
Barrons, Keith C.		P50	1939	1939	1942	1945	1945		
Beal, Wm. J.	Chair		1871				1881		
Beaudry, Randolph			1989	1989	1995	2001			
Bedford, Clifford L.			1949		1949	1959		1977	To FS in 1960
Behe, Bridget			1997		1997	2002			
Bell, Harry K.	E		1953	1953	1960		1964		
Biernbaum, John		P85	1985	1985	1990	1997			
Bittenbender, Harry		M74,P77	1981	1981			1986		
Bjornseth, Earl H.		M38	1945				1946		
Borgstrom, Georg			1956			1956			To FS in 1960
Bowser, Perry H.	E	M40	1941				1945		Upper Peninsula
Boyle, Jesse G.		B07,M14	1908						
Bradford, Frederick C.			1922	1922			1937		
Brown, Lindsay D.		P62	1961	Inst.			1963		
Brown, Olin	S-EL		1929				1957		
Bukovac, M. John		B51,M54,P57	1956	1956	1961	1963		1996	
Cameron, Arthur			1982	1982	1988	1995			
Cardinell, Horace A.			1923			1934		1960	
Carew, H. John	Chair		1955			1955			
Carlson, Robert F.		M49,P52	1946	1946	1955	1963		1979	
Carlson, Wm. H.			1966	1966	1971	1975	2003		
Carmody, John H.	E	B12,M17	1916				1917		
Carolus, Robert L.			1945			1945		1973	
Carpenter, Wm. J. Jr.		M51,P53	1968			1968	1975		
Cassidy, ____									
Chapman, Henry L. R.			1950	1950					
Chase, Wm. R.	S	B78,M90	1979						Supt. HTRC
Clark, James R.			1978	1978			1981		
Cook, James A.			1954	1954			1960		
Coryell, R. J.			1893						
Craig, Albert G.		M09					1906		
Crandall, C.S.	S	B1873,M89					1890		
Cregg, Bert			1999	1999					
Crist, J.W.			1924		1927				
Davidson, Harold		M54,P57	1950	1958	1962	1970		1985	
Dean, Bill			1976	1976			1978		
Dedolph, Richard			1960	1960			1964		
De Hertogh, August A.			1965	1965	1969	1972	1978		
Dennis, Frank G. Jr.			1968		1968	1970		1996	
Dewey, Donald H.			1951	1951	1953	1960		1983	
Dietz, Carl			1938				1938		
Dilley, David R.		B55,M57	1960	1960	1964	1969		2005	

Name		*	MSU Degrees	Appt	Asst	Assoc	Full	Resign	Retire	Notes
Dolby, Joe		Inst.	P81	1978				1979		
Downes, John Dixon			M51,P55	1955	1955	1961	1969	1970		
Dunbar, Donald A.	1979		B52,M68,P73	1966	1966	1978		1979**		
Dutton, Walter C.			M25	1913				1936		
Edmond, J. B.		Inst.	B23	1924				1929		
Edson, Charles E.		E	B80,M86,P91	1994		1999				
Erwin, Patricia (See Zandstra, Patricia)										
Eustace, Harry J.		Chair	B01	1909			1909	1919		
Ewart, Lowell				1977		1977	1982		1996	
Fails, Barbara				1985	1985	1988				
Farrand, Thomas A.		S-SH		1921				1923**		Supt, SH Station
Felber, Irma M.				1943	1946			1948**		
Fernandez, R. Thomas				1999	1999	2004				
Fletcher, Stephenson W.		Chair		1905				1905	1907	
Flore, James A.			B68,M73,P75	1974	1974	1979	1984			
Fobes, Jon				1977	1977			1981		
Freeman, Fred W.		S	B49,M51,P63	1955	1961	1968			1986	Supt. Hidden Lake
Frisbey, Ardeth				1954				1955		
Fuller, ____				1870						
Fulton, S. H.		S		1900						Supt.,SH Station
Gardner, Victor R.		Chair	B05	1922			1922		1949	
Garfield, C. W.		S	B1870,M73	1875				1878		
Gaston, Harold P.		S	M26	1926	1946				1968	
Gibson, Clifford										
Giefel, Marjorie		I, RA		1944				1947		
Gilmore, John		S	B60,M62	1962					1999	Supt., Graham Sta.
Gladden, H. P.			B1885	1893						
Gregg, Orestes I.		I	B07	1907				1912	1947	
Gruber, Susan			B88,M92	1992	1992			1999		
Grumet, Rebecca			M80,P85	1987	1987	1993	1999			
Gulley, A. G.		S	B1868,M73	1890	1876-77?					
Gulley, Frank A.		S	B1885,M80	1878						
Gunson, Thomas				1891					1930	
Hafer, Arnold		S		1978					1992	Supt, Sodus
Halligan, Charles P.		Chair		1906				1923		
Hamner, Charles L.				1945		1945	1950	1966		
Hancock, James				1979	1979	1983	1989			
Haney, W. Judson				1949	1949	1958			1963**	
Hanson, Eric				1984	1984	1990	1997			
Hayes, G. T.		I		1916				1917		
Hedrick, Ulysses P.		Chair	B1893,M95	1895	1895		1902	1905		
Heeckt, Otho				1955						
Heins, Royal				1978	1978	1983	1989		2004	
Helsel, Diana				1980	1980			1981		
Herner, Robert C.				1968	1968	1973	1979		2001	
Hewetson, Frank N.			M36,P54	1937	1943			1945		
Higby, Russell										
Hoernschmeyer, Robt. D.			B78	1978				1979		
Holmes, John C.				1860-62					1861/82?	
Honma, Shigemi				1956	1956	1960	1966	1986		
Hood, G.W.		I		1912				1914		
Hootman, H. Donald		E	B24,M59	1914		1941			1959	
Howell, G. Stanley Jr.				1969	1969	1971	1980		2006	
Hoxie, Clarence E.		S	B32,M33	1936	1946			1949		Supt. Hidden Lake
Hull, Jerome			B52,P58	1964		1964	1971		1997	
Iezzoni, Amy				1981	1981	1986	1993			
Isbet, Arthur L.			B42	1948	1948			1953		
James, Douglas M.				1972-3						
Jeffries, R. R.				1919					1919	
Jiang, N.				2004	2004					

Name	*	MSU Degrees	Appt	Asst	Assoc	Full	Resign	Retire	Notes
Johnston, Stanley	S-SH	B20,M30	1920					1969**	Director, SH Station
Jones, Douglas M.			1972				1973 ?		
Kelly, John F.	Chair	B53,M57	1978			1978		1998	
Kelly, Robert J.	I	B74,M77	1977				1978		
Kelty, Russel H.		B19	1927					1950	
Kenworthy, Alvin L.			1947	1947	1949	1954		1978	
Kesner, Charles D.		B61,M62,P66	1966	1970	1974	1986		1992	
Kessler, George M.		P53	1947	1954	1971			1982	
Knapper, Louis	S		1881						Supt.,Graham St.
Kohler, Arthur R.			1906						
Krauskopf, Dean M.			1977	1977					
Kremer, John C.			1922					1953	To ENT in 1944
Krone, Paul R.			1930		1946	1956	1950	1965	
Lang, Gregory			2000			2000			
Lang, N. Suzanne		B77	2000		2000				
Langer, Clarence A.	E		1946	1946			1954		
Larsen, R. Paul		P55	1955	1955	1959	1965	1968		
Laurie, Alex			1925	1925			1929		
Lauter, Robert			1920						
Layden, Suanne T.			1978	1978			1981		
Lewis, Clarence E.			1957		1958	1964		1972	
Lewis, E. P.	I		1923						
Lickfeldt, Ardeth				1947					
Lindstrom, Richard S.			1953	1956	1963		1968		
Loescher, Wayne	Chair		1990			1990			
Long, Wm. G.			1954	1954			1957		
Loree, Robert E.		B13,M25	1913	1925			1929	1946	
Lownds, Norman		B78,M84,P87	1997	1997	2003				Dir. Ch.Garden
Lucas, Eugene H.			1941	1943	1945	1948		1961**	
Lundeen, Glen A.			1957	1957			1960		To FS in 1960
Lyon, Theodatus T.	S		1885					1898	Supt. S. Haven St.
Mahoney, Charles H.		P31	1931				1938		
Markarian, Deran			1960	1960	1965		1967		
Marshall, Roy E.			1920		1920	1935		1957	
Maxon, Marcus A.	I		1946				1947 ?		
McArdle, F. J.			1954				1960		
McCue, Charles A.		B01	1903				1907		
McLean, Wm.	E							1981	
McLellan, Mary	E,Spec		1994						
Mecklenburg, Roy A.		B58	1964	1964	1970	1977	1977		
Merrill, Thais A.		M33,P54	1935	1935	1943		1946		
Mitchell, Arthur E.			1947	1947	1950	1954		1970**	
Mockaitis, Joseph M.			1964						
Moon, H. C.	E		1918				1921		
Moore, H.C.			1917 ?						
Motes, James E.			1972	1972	1976		1977		
Moulton, James E.			1944	1944	1958			1978	
Mullett, C.E.	E		1952	1952			1964		
Nair, Muraleedharan G.			1987	1987	1993	1998			
Neilson, James A.			1929				1935		
New, E. H.	I	P61	1947	Inst. '56-'58 ?					
Nicklow, Clark			1963	1963	1968		1972		
Ngouajio, Mathieu			2001	2001					
Noteware, I. R.	S-SH		1914				1917		Supt., SH Station
Nuttall, Richard S.	I		1956				1958		
O'Rourke, Francis L.S.			1945	1945				1964	Supt., Hidden Lake
Paris, Clark	I	P56	1956						
Partridge, Newton L.			1920					1945	
Parvin, Philip E.		P65	1958				1960		
Poff, Kenneth L.	AJ		1998			1998			

Name	*	MSU Degrees	Appt	Asst	Assoc	Full	Resign	Retire	Notes
Perry, Ronald	Chair		1980	1980	1985	1993			
Peterson, Clinton E.			1954		1954	1958	1968		
Peterson, N. Curtis			1984	1984	1989		1998		
Peterson, Ralph W.		B16	1917 ?						
Petrie, John A.		B14	1916				1917		
Pickford, Irvin T.	E	B13,M19	1918				1921		
Pike, Leonard M.		P67		1967	1967			1968	
Poesch, Gustave H.									
Post, Kenneth E.	E	B24	1928				1930		Ext. Flor.
Prentiss, Albert N.	Chair	B1861,M64	1863				1869		
Price, Hugh		P69	1971	1971	1974	1969	1990		
Putnam, Alan		M63,P66	1965	1966	1970	1974		1990	
Rasmussen, E.J.			1936	1946	1944		1947		
Rasmussen, H. Paul.		M62,P65	1966	1966	1969	1973	1981		
Reath, A. Norman Jr.	I	M53	1949				1953		
Richey, Fred	S		1958					1990	Supt. EL
Ricks, Glenn L.	E	M33	1931,34				1931,35		
Ries, Stanley K.		B50	1953	1953	1958	1965		1993	
Roberts, Evan P.	I, S	B37,M41,P58	1945				1957		Greenhouse Mgr.
Robertson, W. E.			1943						Food Science
Rood, Paul J. Jr.		B50,M50,P53	1942						
Rose, John W.	E	M48	1946	1946			1954		
Rowe, D. Bradley			1997	1997	2003				
Runkle, Erik		B93,M96,P2000	2000	2000					
Russell, Clive E.		B26	1937		1937			1961	
Rutland, Rufus	I	M60,P65	1961				1963		
Sargent, Steven A.		M79,P84	1984	1985			1987		
Satterlee, James	Chair	B1869,M74	1869				1885		
Saylor, Jesse L.	I	M70	1973						
Schultz, Joseph H.			1939				1939		
Schutzki, Robert E.			1982	1989	1994				
Schwartz, John		M54					1955		
Seaton, Henry Lyle		M33	1930				1942		
Sherwood, Charles H.		P57	1945	1946			1949		
Shull, Vivion	S		1968				1981	1994	Specialist, Elec. Optics
Siegl, Margaret A.	I		1979				1984		
Sink, Kenneth C.			1963	1963	1968	1975			
Skeltis, Gerald J.	S		1979						Supt., Clarksville
Snapp, Sieglinde			1999	1999	2004		2005		
Spangler, Ronald		P71	1972	1972	1976		19		
Stinson, Richard F.			1955	1955	1959		1967		
Starr, George E.			1923						
Taft, Levi R.	Chair		1888			1888	1902		
Taylor, J. Lee		M57	1960	1960	1967	1971		1988	
Taylor, Jane L.	E,AJ		1993					1999	Dir. Children's Garden
Teske, August H.	E	B26	1926				1926		
Teubner, Frederick G.			1953	1954			1959		
Thomas, _____			1870						
Thurber, George	Chair		1858					1863	
Titus, John S.	I	B46,M47	1947				1949		
Toenjes, Walter	S	M28	1928				1962		Supt., Graham Station
Tolle, L. J. Jr.			1955				1964		
Tomkins, John P.			1950	1950			1953		
Tracy, Will W.	Chair	B1867,M70	1869				1872		
Trotter, Eugene E.	AJ		1974	1974	1982	1989		1990	
Tukey, H. B.	Chair		1945			1945		1963	
Van Nocker, Steven			1998	1998	2004				
VanDenBrink, Ceel	AJ	M67	1967	1970	1976			1977	
Vest, H. Grant Jr.			1970		1970		1976		
von Oppenfeld, Horst			1953				1955		

Name	*	MSU Degrees	Appt	Asst	Assoc	Full	Resign	Retire	Notes
Wade, L. F.	S		1919				1920		Supt., Graham Station
Waid, L. G.			1914				1919		
Ward, Clarence W.	E		1914				1921		
Warner, Ryan		B96	2005	2005					
Watson, Donald P.			1948	1948	1953		1964		
Wells, H. G.	S		1924				1930		
Wels, H.M.			1924				1930		Supt., Graham Station
White, Oliver K.	E	B07	1909				1915		
Widders, Irvin E.			1982	1982	1988	1994			
Wight, H.F.	E		1918						
Widmoyer, Fred B. Jr.		P54	1954	1954			1960		
Wilde, Earle I.	S		1949		1949				Supt. Hidden Lake
Wildon, Carrick E.			1929	1929	1938	1955		1964	
Wilkin, T. A.	S		1908				1914		Supt., SH Station
Williams, Loren V.		B16	1917						Gardener
Wilson, C. E.			1930						
Wittwer, Sylvan H.			1946	1946	1948	1951		1983	
Woodbury, George W.	E	B04,M31	1931					1933	
Word, Clarence W.	E		1914 ?						
Yeager, A. F.			1937				1939		Veg. Br. at Chatham
Zabadal, Thomas	S		1989		1989	1992			Supt. SWMREC
Zandstra, Bernard H.			1977	1977	1982	1990			
Zandstra, Patricia Erwin	I	B73	1974	1974				1999	
Zeiger, Donald C.			1956	1956			1958		

*Position, other than professor: E = Extension; S = Supervisor, Research Station; RA = Res. Assoc.; I = Instructor; AP- Adjunct Prof. ** Died prior to retirement.

Appendix 3

Persons Named to Halls of Fame in Old Horticulture Building

When the Horticulture building was constructed in the 1920s, an interesting amenity was added: The Horticulture Halls of Fame. The faculty selected 40 famous horticulturists, and bronze plaques honoring them were placed on each floor, those on the first floor honoring people who were famous state horticulturists, those on the second floor honoring national horticulturists, and those on the third floor honoring internationally known horticulturists. **Liberty Hyde Bailey** qualified for all three floors, but the faculty felt that anyone whose name was placed on the third floor would naturally be well-known at both the national and the state levels. The same is true for those honored by having their names on the second floor. The names are listed alphabetically, within floors, below.

Third floor – International (14)

Bailey, Liberty Hyde Jr. (1858-1954). Born in South Haven, Mich. B.S., MAC 1882. Professor of Horticulture, MAC, 1885-88. Designed building (Eustace Hall) for teaching of horticulture. Prof. of Horticulture, subsequently Dean of the College of Agriculture, Cornell University, 1888-1913. Teacher, prolific writer, author of numerous articles and books, and editor of *Cyclopedia of Horticulture* and other compendia. Specialized in taxonomy of *Rubus* and the palms, founded Bailey Hortorium at Cornell by donating his collection of plant specimens.

Downing, Andrew Jackson (1815-1852). Born in New York, drowned when a steamboat exploded on the Hudson River. First landscape gardener of America. Designed grounds near Capitol, the White House, and the Smithsonian Institute in Washington. Created a new school of simple, natural, American landscape gardening, Wrote *Treatise of Theory & Practices of Landscape Gardening*, *Fruits and Fruit Trees of America.*

Du Monceau, Henri Louis Duhamel (1700-1781). One of the youngest scientists ever admitted to the French Academie de Sciences, based on work with diseases of saffron. Wide range of interests, including design of ships, electricity, forestry, plant anatomy and physiology. Wrote extensively on horticultural plants; books included *Traite des Arbres Fruitiers*, and *Physique des Arbres.*

Evelyn, John (1620-1706). English gentleman, gardener, author, member of the Royal Horticultural Society. Conceived of heating greenhouses through flues. Credited with introduction of topiary. Commissioned to compile work on forestry. Published *Sylva* in 1670.

Knight, Thomas Andrew (1759-1838). English gentleman farmer, plant breeder and physiologist. Realized the importance of carbohydrate accumulation for fruit bud development, first President of Royal Horticulture Society, served in office for 20 years.

LeMoine, Victor (1823-1912). French nurseryman, no formal education. Introduced many new improved varieties of geranium, tuberous rooted begonia, double-flowered lilac, hybrid clematis, weigela and many other plants. Awarded the White medal from the Massachusetts Horticultural Society. Appointed Knight and officer of the French Legion of Honor.

Le Notre (1613-1700). French landscape gardener. Designed many famous gardens in France and other parts of Europe. Two of the most famous are: Vaux-le-Vicomte, outside of Paris, and Versailles, the most famous garden in Europe. Originated the grand and expansive style of elaborate French landscape design, influential from the 18th through the 20th century.

LeRoy, Andre (1801-1875). French nurseryman and author. He developed his father's small nursery (1.4 acres) into a large, 580-acre, production nursery, and shipped thousands of trees to the United States during the French revolution. Many of our pear trees came from his nursery. Wrote *Dictionnaire de Pomologie,* a valuable source of information on the history of varieties, a copy of which is in the MSU library.

Lindley, John (1799-1865). English botanist, horticulturist, and author. First professor of Botany at the University of London, 1829. Wrote *Observations on the Structure of Fruits* (1819). In 1820 he was elected to both the Linnean and the Geological Societies. Lindley, together with George Bentham, organized the first flower show in England in 1830.

Olmsted, Frederick Law (1822-1903). Born in Connecticut, one of America's premier landscape gardeners. Designed many of the nation's finest parks, including Central Park in New York, the grounds of the nation's capital, plus parks in Chicago, Detroit, Buffalo and Boston. He helped Charles S. Sargent design the Arnold Arboretum in Boston.

Repton, Humphrey (1752-1818). English landscape gardener and author. Designed many of the estates of noblemen, including Kensington Gardens and Russell Square, and wrote extensively on landscape design. Proponent of the natural style of landscaping.

Rivers, Thomas (1798-1877). Nurseryman and author. Thomas took over his father's nursery business in 1827 and developed it into one of England's best nurseries, specializing in roses. He authored *Catalogue of Roses, The Rose Amateur's Guide, Miniature Fruit Garden* and many other publications. He was one of the founders of the British Pomological Society, and introduced 'Early Rivers' plum, well-received because of its ability to compete with continental rivals.

The Vilmorins, including (1) **Philippe-Victor** Leveque (1746-1804); (2) **Pierre-Philippe Andre de Vilmorin** (1776-1804); (3) **Vilmorin Andrieux e Cie** (1815-___); (4) **Pierre-Louis Francois Leveque de Vilmorin** (____ - ___); (5) **Charles Henry Philippe de Vilmorin** (1843-1873); (6) **Philippe de Vilmorin** (1899- 1917) (killed in WW I). All were members of the famous seed house of Vilmorin in Paris, and were the first to put the seed business on a higher plane. They had their own trial grounds, did plant breeding and made their own selections, invested money in crop improvement, and published books on floriculture. Pierre-Louis also succeeded in increasing the sugar content of beets, reducing the need for importing sugar from the Caribbean during the Napoleonic Wars.

Von Mons, Jean Baptiste (1765-1842). Belgian fruit breeder and nurseryman. Gathered wild pears from the woods, as he supposed this would produce variations. Selected best seedlings when bearing first fruit, before peak of fruiting was reached. Introduced 'Beurre Bosc' and other varieties.

Second floor – National (14)

Barry, Patrick (1816-1890). Native of Ireland. Founded Mt. Hope Nurseries in Rochester, N.Y. with partner George Ellwanger. Editor of catalogue of fruits for American Pomological Society, the *Genesee Farmer*, and the *Horticulturist*; author of *Treatise on the Fruit Garden* (1851), revised and republished as *Barry's Fruit Garden* (1872).

Beach, Spencer Ambrose (1860-1923). Teacher, fruit breeder, head of horticulture at Texas College of Agriculture, Geneva (N.Y.) Experiment Station, and Iowa State College. Breeding activities resulted in introduction of several important fruit varieties. Author of 2-volume *Apples of New York*; one of founding members of the American Society for Horticultural Science.

Downing, Charles (1802-1885). Pomologist who started a fruit tree nursery in the Hudson River Valley at Newburgh, N.Y., with younger brother A. J. Downing. Sold nursery in 1850, then started studies of varieties of fruit and developed a test orchard – 1800 varieties of apples, 1000 varieties of pears and various other fruits. Continued and revised the monumental work *Fruits and Fruit Trees of America* originally written by his brother.

Goff, Emmett Stull (1852-1902). Horticulturist at Geneva (N.Y.) Experiment Station 1882, Prof. of Horticulture, University of Wisconsin 1889. Pioneer in spraying of, and sprayers for, fruit trees. Conducted first successful experiments with fungicides to control apple scab. Developed new and hardy varieties of plums. Author of *Principles of Plant Culture* and *Lessons in Pomology.*

Hedrick, Ulysses Prentiss (1870-1951) (B.S. 1893; M.S. '95). Teacher, researcher, author. Asst. Prof. of Horticulture, Michigan Agricultural College, 1893-5; Prof. of Botany and Horticulture, Oregon Agricultural College, 1897-9; Prof. of Botany and Horticulture, Utah Agricultural College, 1899-1902; Head of Horticultural Research, Professor of Horticulture, Michigan Agricultural College, 1902-05; Vice-Director, 1905-1928 and Director, 1928-38, Geneva Agricultural Experiment Station. Author of a series of books describing fruits, including *The Grapes of New York, The Cherries of New York, The Peaches of New York,* and *The*

Pears of New York, and of *Cyclopedia of Hardy Fruit*, and many others.

Henderson, Peter (1822-1890). Native of Scotland. Leading market gardener near Jersey City, N.J., florist, seedsman, and author. Founded seed business in New York City in 1865. Authored many articles, including *Practical Floriculture,* the first American text on floriculture; *Gardening for Pleasure; The Handbook of Plants;* and many others.

Hovey, Charles Mason (1810-1887). New England nurseryman, seed merchant, and author. Introduced the 'Hovey' strawberry. Best known as editor of *Magazine of Horticulture, 1835-68.* Author of *Fruits of America.* President of Massachusetts Horticultural Society.

Longworth, Nicholas (1783-1863). Father of American grape culture. Retired from business in 1828 and devoted himself to viticulture and winemaking at farm near Cincinnati. Imported thousands of grapes, introduced viticulture into Ohio Valley. Introduced first improved cultivar of *Rubus occidentalis*, 'Ohio Everbearing.' Published many articles on grapes, strawberries, other fruits.

Loudon, John Claudius (1783-1843). Native of England, landscape gardener and garden writer. He edited five monthly publications, published *Encyclopedia of Gardening* (1822), *Encyclopedia of Agriculture* (1825), *Encyclopedia of Plants* (1829) and *Encyclopedia of Trees and Shrubs* (1829), plus many other articles on plants and gardens.

Munson, Thomas Volney (1843-1913). Nurseryman, grape grower and breeder, author. Operated a nursery and vineyard in Denison, Texas. Author of: *Classification and Generic Synopsis of the Wild Grapes of America*, USDA Pomology. Bul. #3 (1890), *Grape Culture and Foundations of American Grape Culture*, considered to be a monumental work on grapes. Developed grapes adapted to environmental conditions in southern U.S. Work on the *Phyloxera* root louse problem in France helped save the French grape industry.

Prince, William (1725-1802). Son of the founder of Prince Brothers Nursery in Flushing, L.I., N.Y., which was founded in 1730 as the first large, commercial nursery for fruit trees, then expanded to include ornamentals. The nursery was the source of most of the nursery stock used in the plantings of the young nation, and introduced many foreign trees and other plants.

Saunders, William (1822-1900). Nurseryman, landscape gardener, horticulturist. Trained at Kew Gardens in England. Came to the United States from Scotland about 1848. Formed partnership in the nursery business with Thomas Meehan of Philadelphia in 1854. Appointed Botanist and Superintendent of Horticulture of the newly created U.S. Department of Agriculture in 1862. Wrote for *Gardeners' Monthly, Hoveys Magazine,* and *The Horticulturist.* Planned many parks in Eastern United States, as well as the cemetery at Gettysburg. He introduced hardy Russian apples and the Bahia or 'Washington Navel' orange into the United States. Called the "Father of the Grange."

Tracy, Will Warner (1845-1925). Horticulturist, seed producer. B.S. '67, M.S. '70, Michigan Agricultural College. Hon. Science Degree 1907. Prof. of Horticulture, Michigan Agricultural College, 1870-72. Superintendent of testing gardens of U.S. Dept. of Agriculture beginning 1902. Established apple and pear orchard on Old Mission peninsula in Grand Traverse County.

Wilder, Marshall Pinckney (1798-1886). Amateur fruit grower. Founder and first president of the American Pomological Society, in which capacity he served for some 40 years. Raised many pears from seed, originated 'Buerre d'Anjou' cultivar. Imported and cultivated roses, azaleas, lilies, camellias.

First floor – Michigan (12)

Breitmeyer, John (____ - ____) Pioneer florist in Detroit. Born in Germany, came to Michigan in 1862. Established Breitmeyer and Sons, flower and vegetable business that was to become the city's largest floral firm. In 1882, Breitmeyer moved to Mt. Clemens to expand production of roses. Sons Fred and Philip continued the businesses in Mt. Clemens and Detroit, respectively, and Philip served as mayor of Detroit in 1909-1910. The Breitmyer Building, an 8-story "skyscraper", was built in 1906 to serve as headquarters for the company

Davis, Eugene (____-____). Grower of vegetables, mostly in greenhouses in Grand Rapids. Introduced 'Davis Perfect' cucumber.

Farrand, Theodore Austin (_____ - 1923). Fruit grower; 1902-06, first superintendent of South Haven Experiment Station, extension specialist at Michigan State College, Secretary of Michigan State Horticultural Society.

Garfield, Charles William (1848-1934). B.S. '70, M. S. '73, LLD 1917, Michigan Agricultural College; Professor of Horticulture and Foreman of the gardens, Michigan Agricultural College 1873-7; Member State Board of Agriculture 1877-1899; President, Michigan Forestry Commission, considered "Father of Michigan Foresty"; Secretary, Michigan Horticultural Society 1877- 1887. Owned fruit and truck farm near Grand Rapids.

Graham, Robert Darwin (1855-1926). Farmer and banker in Grand Rapids. President, Grand Rapids Fruit Growers Association, V. President, Michigan State Horticultural Society, Member and Chairman, Michigan State Board of Agriculture. Donated 80+ acres of his farm to Michigan Agricultural College for the Graham Horticultural Research Station in Grand Rapids.

Lyon, Theodotus Timothy (1813-1900). Nurseryman. Donor and first Superintendent of South Haven Experiment Station. President and Secretary of the Michigan State Horticultural Society. Left his library to the Horticulture Department. At the time of his death there were over 600 varieties of pears in the South Haven collection.

Monroe, Charles Jay (1839-1919?). South Haven fruit grower, banker, Secretary of Michigan State Horticultural Society.

Morrill, Roland (1852- ____). Farmer who popularized and "grew to perfection" the muskmelon 'Hearts of Gold' on 300-acre fruit and vegetable farm near Benton Harbor. President, Michigan State Horticultural Society; first president of the Michigan Farm Bureau.

Ramsdell, Jonathan Gannett (1830-1903). Judge and fruit grower who pioneered in the development of the fruit industry in the Grand Traverse area. Admitted to the bar in 1857. Clerk of the Michigan Supreme-Court. Special lecturer at MAC on commercial customs and commercial law 1861. Served as President of the Grand Traverse Union Agricultural Society and the Michigan Pomological Society.

Rose, Paul (1857-1913). Fruit grower near Frankfort; also owned orchard in Vincennes, Ind. He introduced the 'Paul Rose' melon, a cross between 'Osage' and 'Netted Gem,' and the most popular melon at that time. Popularized the 'Elberta' peach, and was instrumental in beginning the commercial production of cherries in Benzie County. Won the gold medal for exhibitions of sweet cherries at the Pan-American Exposition in Buffalo in 1901.

Smith, Elmer Denison (1854-1907). With his father, Nathan, built the first of several greenhouses for flower production in Adrian, Mich. in 1870-75, subsequently expanding into wholesale as well as retail sales of other plants. Honorary M.S. in Horticulture, MSC, '27. Author of "Smith's Chrysanthemum Manual," became known as the "Chrysanthemum King of the World." Reportedly originated 643 varieties. Greenhouses covered 50,000 ft^2 at time of death in 1907.

Taft, Levi Rawson (1859-1941). Horticulturist, teacher, author. B.S. in Horticulture, Massachusetts Agricultural College '82; M.S. in Horticulture, University of Missouri '88. Asst. Professor of Horticulture, Massachusetts Agricultural College, 1882-5. Asst. Prof. of Horticulture, University of Missouri, 1885-8. Prof. of Horticulture & Landscape Gardening, Michigan Agricultural College, 1888-1902. State Inspector of Nurseries and Orchards 1902-21; Chief Horticulturist, State Dept. of Agriculture 1921-6. Professor Taft did the first spraying of fruit trees while they were in leaf in the orchards at Michigan Agricultural College. Work commemorated by historical marker at Collingwood entrance to MSU.

Appendix 4

Graduate Degrees Awarded

Name	Degree	Year	Major Prof
Abbott, Charles Elliott	M.S.	1927	
Ackerman, Charles E.	Ph.D.	1954	Haney
Adams, David G.*	M.S.	1962	
Adams, Nancy Elaine	M.S.	1977	Putnam
Adhikar, Rishi Raj	M.S.	1980	Price
Adhikari, Devi Prasad	Ph.D.	2003	Nair
Adler, Keith E.	M.S.	1969	Hull
Adriance, Guy Webb	M.S.	1929	
Adriance, Guy Webb	Ph.D.	1940	
Ahluwalia, Kuldeep Singh	M.S.	1957	Carolus
Ahmed, Iftikhar	M.S.	1987	Dennis
Ahnder, Lamoine Dixon	M.S.	1959	Peterson, C.E.
Aicher, Lauri	M.S.	1983	Sink/Saunders
Aitoubahou, Ahmed	Ph.D.	1991	Dilley
Akula, Geethanjali	M.S.	1996	Grumet
Al Ashkar, Saleh A.	M.S.	1970	
Al Rawi, Dhia H.	M.S.	1965	Stinson
Alamercery, Jacques Marie	Ph.D.	1952	Hamner
Allen, Clarence D.*	M.S.	1960	
Alsip, James L.*	M.S.	1971	Davidson
Amato, Vincent Alfred*	M.S.	1955	Kenworthy
Amezquita-Garcia, Rafael	Ph.D.	1972	Dewey
Amin, Fouad Yehia	M.S.	1951	
Amin, Fouad Yehia	Ph.D.	1952	Watson
Amling, Harry J.	Ph.D.	1958	Kenworthy
Amott, Marilyn Jean	M.S.	1956	Haney
Andersen, Robert Louis	M.S.	1964	Markarian
Anderson, Gary Allen	M.S.	1971	Carpenter
Anderson, Gary Allen	Ph.D.	1973	Carpenter
Anderson, Kendra A.	M.S.	1983	Howell
Anderson, Cheryl M.	M.S.	1970	
Anderson, Wilfred Homer	M.S.	1953	Carolus
Anderson, William Stacy	M.S.	1937	
Andrew, William Treleaven	Ph.D.	1954	Wittwer
Andrews, Flood Shields	M.S.	1928	
Andrews, Paul S.*	M.S.	1951	Watson
Applegate, Howard	Ph.D.	1956	Hamner
Arboleya, Jorge Eduardo.	M.S.	1992	Widders
Arboleya, Jorge Eduardo.	Ph.D.	2003	Zandstra
Archbold, Douglas D.	M.S.	1979	Dennis
Archbold, Douglas D.	Ph.D.	1982	Dennis
Argo, William R	M.S.	1993	Biernbaum
Argo, William R	Ph.D.	1996	Biernbaum
Armitage, Allan M.	Ph.D.	1980	Carlson, W.
Armstrong, William D.	M.S.	1959	Tukey
Arnold, Calvin Eugene	Ph.D.	1969	Mitchell
Arnold, Calvin Eugene	Ph.D.	1969	Mitchell
Arnott, Marilyn Jean	M.S.	1956	Haney
Aselage, John M.	M.S.	1977	Carlson, R.
Ashiru, Gbolahan A.	M.S.	1965	Carlson, R.
Ashiru, Gbolahan A.	Ph.D.	1967	Carlson, R.
Ashkar, Saleh Abdul-Kader	M.S.	1970	Ries
Augustine, Jimmy Jude	M.S.	1972	Baker
Austin, Max E.	Ph.D.	1964	Ries
Austin, William W.*	M.S.	1969	Dilley

Name	Degree	Year	Major Prof
Awad, Marcel Michel	M.S.	1958	Kenworthy
Awad, Marcel Michel	Ph.D.	1961	Kenworthy
Awuma, Kafui	M.S.	1981	Herner
Aya, Frederick Onounuraijete	M.S.	1967	Ries
Ayala, Marlene	Ph.D.	2004	Lang, G.
Ayeh, Eric	Ph.D.	1982	Hancock
Bacher, Jeffery Walter	M.S.	1989	Ewart
Bacher, Jeffery Walter	Ph.D.	1993	Hancock
Badizadegan, Morteza	Ph.D.	1967	Carlson, R.
Badran, Adnan M.	M.S.	1961	Dilley
Badran, Adnan M.	Ph.D.	1963	Dilley
Bai, Whei Shin	M.S.	1994	Carlson, W.
Bai, Yu Yu	M.S.	1996	Kelly
Baker, Jean Beard	M.S.	1994	Hancock
Balboa-Zavala, Orlando	Ph.D.	1975	Dennis
Ballinger, Walter Elmer	M.S.	1955	Kenworthy
Ballinger, Walter Elmer	Ph.D.	1957	Kenworthy
Ban, Jun	Ph.D.	1996	Dennis
Banks, Edward Arthur Hasterley	M.S.	1934	
Barnes, Jane Patricia	M.S.	1981	Putnam
Barnes, Jane Patricia	Ph.D.	1985	Putnam
Barnhart, June L.*	M.S.	1974	Taylor
Barrett, James Edward III	Ph.D.	1978	De Hertogh
Barrett, Robert P.	M.S.	1987	Ries
Barrett, Robert Patrick	M.S.	1987	Bittenbend/Ries
Barrick, William Edgar	Ph.D.	1976	Davidson
Barrons, Keith Converse	Ph.D.	1950	
Bartholomew, Donna L.*	M.S.	1983	
Bartz, Donald F.*	M.S.	1956	Kenworthy
Bassett, Charles E.	M.S.	1913	Hon.
Batjer, Lawrence Paul	M.S.	1930	
Bayer, Lyn F.	M.S.	1975	Mecklenburg
Beard, Bruce D.	M.S.	1964	Mitchell
Beard, Timothy Donalhue*	M.S.	1960	Kenworthy
Beattie, David J.	Ph.D.	1977	Spangler
Beaver, James Allen	M.S.	1993	Iezzoni
Beck, Gail Edwin*	M.S.	1949	
Beck, Gary R.*	M.S.	1973	Sink
Becker, Wayne Alan	M.S.	1988	Ewart
Beckman, Thomas George	M.S.	1984	Perry
Beckman, Thomas George	Ph.D.	1989	Perry/Flore
Beckwith, Andrea G.	M.S.	2003	Heins
Bednarz, Richard Michael	Ph.D.	1970	Rasmussen, H.
Beier, Robert David*	M.S.	1955	Wildon
Belter, Harvey James*	M.S.	1970	Kenworthy
Bemis, William Puttnam	M.S.	?	Carolus
Bemis, William Puttnam	Ph.D.	1952	Tukey/Drew
Bempong, Maxwell A.	Ph.D.	1967	Sink
Benarde, Melvin A.	Ph.D.	1954	
Bennett, Edmund Roswell*	M.S.	1909	Hon.
Benschop, Maarten	M.S.	1973	De Hertogh
Benvenuti, Giovanni	M.S.	1972	Dennis
Benvenuto, Mathew J.*	M.S.	1973	
Berghage, Robert Dale Jr.	M.S.	1986	Widders
Berghage, Robert Dale Jr.	Ph.D.	1989	Heins

Name	Degree	Year	Major Prof
Bergman, Ernest L.	M.S.	1956	Kenworthy
Bergman, Ernest L.	Ph.D.	1958	Kenworthy
Berninger, Louis Michael	M.S.	1954	Watson
Berkheimer, Steven	M.S.	2004	Hanson
Bernard, Melvin A.	Ph.D.	1954	Bedford
Bernstein, Paul	M.S.	1942	
Berry, Earl Martin	M.S.	1932	
Berry, James W., Jr.	M.S.	1966	
Berry, James W., Jr.	Ph.D.	1966	Carolus
Berryhill, Kelli Jo	M.S.	2005	Lownds
Bert, John S. Jr.	M.S.	1974	Honma
Bessey, Paul Mack	Ph.D.	1957	Carolus
Bethke, Charles	Ph.D.	1986	Carlson, W.
Bhandall, Bir Singh	M.S.	1946	
Bible, Bernard Bond	M.S.	1966	Carolus
Bible, Bernard Bond	Ph.D.	1969	Ries
Biernbaum, John A	Ph.D.	1985	Ries
Billings, Donald H.*	M.S.	1958	Bedford
Bird, Harold Sterling*	M.S.	1919	
Birdsell, Duncan G.	M.S.	1956	Watson
Bittenbender, Harry Clair	M.S.	1974	Howell
Bittenbender, Harry Clair	Ph.D.	1977	Ries
Bittenbender, Sarah Ann Engstrom	M.S.	1975	Vest
Bittner, Carl	M.S.	1933	
Bjornseth, Earl Hughes	M.S.	1938	
Black, Brent L	M.S.	1994	Bukovac
Blanchard, Matthew	M.S.	2005	Runkle
Blanpied, George David	Ph.D.	1959	Dewey
Blumer, Thomas Nelson	Ph.D.	1954	Marshall
Boldt, Paul Frederick	Ph.D.	1979	Putnam
Bolster, Marcia A.	M.S.	1955	
Bonamy, Prince Albert	Ph.D.	1976	Dennis
Bond, Ann Marie	MS	2004	Iezzoni
Boonstra, Richard N.	M.S.	1956	Watson
Borden, Heather	M.S.	2002	Snapp
Borkird, Chumpol	M.S.	1981	Sink
Bornstein, Carol J.	M.S.	1979	Spangler
Bose, Prithwish C.	Ph.D.	1958	Honma
Bosse, Father Gernard	M.S.	1940	
Bourne, Michael L.	M.S.	1981	Dewey
Bouwkamp, John C.	M.S.	1966	Honma
Bouwkamp, John C.	Ph.D.	1969	Honma
Bowden, Ray Alva	M.S.	1949	Hamner
Bowers, R. Charles *	M.S.	1960	Dewey
Bowman, Frank Thomas	Ph.D.	1940	
Bowser, Perry Homer	M.S.	1940	
Boyes, Charlene Jan*	M.S.	1980	Sink
Boylan, Hugh Christopher	M.S.	1972	Davidson
Boylan, Hugh Christopher	Ph.D.	1975	Mecklenburg
Boylan-Pett, Walter L.	M.S.	1986	Cameron
Boyle, Jesse George*	M.S.	1914	
Bradford, Kent Jay	M.S.	1977	Dilley
Bradford, Larry James	M.S.	1970	Hull
Braudo, Alvin Isaac	M.S.	1954	
Bray, John K.	M.S.	1958	
Breitkreutz, Sarah Lynn	M.S.	2000	Flore
Brenner, Mark L.	Ph.D.	1970	Bukovac
Brettin, Thomas Scott	M.S.	1996	Iezzoni
Brierly, Wilfred Gordon	Ph.D.	1930	
Brightwell, William Thomas	M.S.	1940	

Name	Degree	Year	Major Prof
Brison, Fred Robert	M.S.	1931	
Brown, Howard Dexter	Ph.D.	1927	
Brown, John F.	M.S.	1951	
Brown, Lindsay Dietrich	Ph.D.	1962	Carolus
Brown, William. C.	M.S.	1935	
Bruce, Sarah Eleni	MS	1999	Rowe
Brush, F. Raymond*	M.S.	1950	
Bryant, Clyde Alfred	M.S.	1948	
Buckley, Michael E.	M.S.	1959	Motts, G. N. ?
Bukovac, Martin John*	M.S.	1954	Tukey
Bukovac, Martin John*	Ph.D.	1957	Wittwer
Bunemann, Gerhard	M.S.	1956	Dewey
Bunemann, Gerhard	Ph.D.	1958	Dewey
Bunting, George S., Jr.	M.S.	1951	Watson
Burmeister, Douglas Michael	M.S.	1991	Dilley
Burmeister, Douglas Michael	Ph.D.	1993	Dilley
Burnham, Milo	Ph.D.	1965	Peterson, C.E.
Byrd, Duncan Alton	M.S.	1930	
Byrne, Michael Edward	M.S.	1976	Howell
Cain, David Wayne	M.S.	1975	Andersen
Cain, David Wayne	Ph.D.	1978	Andersen
Caldwell, Munns A.	M.S.	1958	
Callow, Mollie Stark*	M.S.	1989	Cameron
Callow, Peter Webb*	M.S.	1993	Hancock
Camelatto, Darcy	Ph.D.	1992	Dennis
Cameron, John Scott	Ph.D.	1986	Hancock
Campbell, Alan D.	M.S.	1981	Davidson
Campbell, Joseph Dempsey	Ph.D.	1953	Tukey/Carolus
Campbell, Ronald Wayne	Ph.D.	1957	Mitchell
Canli, Fatih Ali	Ph.D.	2002	Perry
Canoles, Mauricio Alejandro	Ph.D	2004	Beaudry
Carlson, Carl	M.S.	1961	Kenworthy
Carlson, Donald Bernard	M.S.	1964	Davidson
Carlson, Donald Bernard	Ph.D.	1967	Ries
Carlson, Robert Fritz	M.S.	1949	
Carlson, Robert Fritz	Ph.D.	1952	Hamner
Carlton, Bruce Charles	M.S.	1958	Peterson, C.E.
Carlton, Bruce Charles	Ph.D.	1960	Peterson, C.E.
Carmody, John Henry*	M.S.	1917	
Carpenter, Edwin David Jr.	M.S.	1962	Watson
Carpenter, Edwin David Jr.	Ph.D.	1964	Watson
Carpenter, William John Jr.	M.S.	1951	
Carpenter, William John Jr.	Ph.D.	1953	
Caryl, Ralph Emerson*	M.S.	1921	
Case, William Henry*	M.S.	1948	Marsh//Robinson
Cayer, Charlene J. (see Irwin, Christine)	M.S.	1978	Price
Chace, William George Jr.	M.S.	1957	Dewey
Chace, William George Jr.	Ph.D.	1959	Dewey
Chamberlain, S. H.	M.S.	1930	
Chandler, Edward Lee	Ph.D.	1954	Watson
Chang, Loong-Sheng	MS	1986	Iezzoni
Chang, Loong-Sheng	Ph.D.	1990	Iezzoni
Chang, Silas H.	M.S.	1950	
Chang, Yu Chen	Ph.D.	1995	Nair
Chaplin, Michael Hovey	Ph.D.	1968	Kenworthy
Charles, Kevin Sylvester	M.S.	2005	Ngouanjio
Chase, William Robert	MS	1990	Putnam
Chen, Nung Che	Ph.D.	1980	Baker/Honma
Chilembwe, Eric Hetlason Chikafa	Ph.D.	1991	Dennis
Ching, Francis F. T.*	M.S.	1956	Swenson,R.M.

Name	Degree	Year	Major Prof
Chong, Joaquin Andres	MS	2000	Heins
Christensen, M. Dale	Ph.D.	1968	Kenworthy
Chunxiao, Jiang	Ph.D.	1996	Sink
Cichewicz, Robert Henry	Ph.D.	2002	Nair
Cisneros, Juan Jose	M.S.	2005	Zandstra
Clancy, Kathryn J.*	M.S.	1977	Taylor
Clark, Benjamin Edward	Ph.D.	1949	Wittwer
Clarke, Duane G.*	M.S.	1978	Carlson, W.
Clerx, Wilhelmus Arthur	M.S.	1960	Kenworthy
Cline, John Arthur	M.S.	1990	Hanson
Close, C. P.	M.S.	1897	
Clough, Emily Amanda	M.S.	1999	Cameron
Cloutier, Renee Rose	M.S.	1999	Schutzki
Coleman, Jane Margaret	M.S.	1965	Lindstrom
Coleman, Jane Margaret	Ph.D.	1967	Lindstrom
Collins, Carolyn Ann	M.S.	1997	Fails
Conolly, Henry Milton*	M.S.	1914	
Cook, Alvis Clinton	M.S.	1934	
Cook, Rodney Lane	M.S.	1987	Dennis
Cooper, Calvin Charles	M.S.	1951	Watson
Cooper, Calvin Charles	Ph.D.	1954	Watson
Cordner, Howard B.	M.S.	1928	
Cordy, Clifford Bernard	M.S.	1934	
Corfield, James L.*	M.S.	1968	Kenworthy
Coston, Donald Claude	M.S.	1974	Kenworthy
Coston, Donald Claude	Ph.D.	1976	Kenworthy
Coulter, Llewelyn LeGrande*	M.S.	1948	Wittwer
Cousins, Wayne Boyd	M.S.	1975	Price
Cowen, Neil Madison*	M.S.	1981	Helsel
Cowles, Glenn Hill	M.S.	1937	
Craig, Albert George*	M.S.	1909	Hon.
Crankshaw, Carol Lynn Hill	M.S.	1983	Carlson, W.
Crawford, Allen Edwin	M.S.	1951	
Crocker, Thomas Floyd	M.S.	196?	Kenworthy
Crocker, Thomas Floyd	Ph.D.	1971	Kenworthy
Crocker, Timothy Eugene	M.S.	1967	Kenworthy
Crocker, Timothy Eugene	Ph.D.	1970	Kenworthy
Cross, Frank Baker	M.S.	1927	
Cuthbert, Robert Louis	M.S.	1966	Carolus
Dacosta, Gordon Cecil	Ph.D.	1952	Lucas/Carolus
Daniels, Robert W.	M.S.	1970	Kenworthy
Dasilva, Norberto	M.S.	1975	Baker
Date, Kanchan	M.S.	2004	Snapp
Davidson, Harold	M.S.	1953	
Davidson, Harold	Ph.D.	1957	Hamner
de Barros, Maria Teresa Franco	Ph.D.	1993	Howell
de Maisonneuve, Jean-Paul Gerard	M.S.	1943	
De Mille, Phildon Brent	M.S.	1974	Vest
Dean, Marjorie Susan	M.S.	1979	Carlson, W.
Debarros, Maria Teresa Franco	Ph.D.	1993	
DeFrank, Joseph	M.S.	1980	Putnam
DeFrank, Joseph	Ph.D.	1983	Putnam
Dejong, Jan	Ph.D.	1975	Honma
Del Rosario, Dafrosa Arganosa	Ph.D.	1972	Putnam
Delano, Richard Hugh*	M.S.	1959	Widmoyer
DeMille, Phildon B.	M.S.	1974	Vest
Deng, Weimin	M.S.	1999	Beaudry
DeMille, Phildon B.	M.S.	1974	Vest
Deng, Weimin	M.S.	1999	Beaudry
Denna, Donald	M.S.	1958	Kenworthy

Name	Degree	Year	Major Prof
Dennis, Jennifer	Ph.D	2004	Behe
Derthick, Scott L	M.S.	1991	Carlson, W.
Dessert, James Michael	Ph.D.	1981	Fobes
Deyton, Dennis Edward	M.S.	1973	Carolus
Diaz-Montenegro, Daniel Humberto	Ph.D.	1979	Dennis
Dickson, Michael Hugh	M.S.	1956	Peterson, C. E..
Dickson, Michael Hugh	Ph.D.	1958	Peterson, C. E..
Dietz, Carl P.	M.S.	1940	
Dilley, David R.*	M.S.	1957	Kenworthy
Dilley, Richard A.*	M.S.	1959	Mitchell
Ding, David Yu	M.S.	1969	Dilley
Diol, Pritam*	M.S.	1933	
Disegna, Edgardo J.	M.S.	1994	Flore
Dittmer, Thomas	MS	1986	Howell
Dogras, Constantinos C.	M.S.	1972	Herner
Dogras, Constantinos C.	Ph.D.	1975	Herner
Dolby, Donn	M.S.	1953	
Dolby, Joe Meredith	Ph.D.	1981	Putnam
Dollhopf, Carl H.*	M.S.	1959	
Donnalley, William F.	Ph.D.	1964	Ries
Donnell, Mary L.	M.S.	1981	Rasmussen
Donoho, Clive Wellington Jr.	Ph.D.	1960	Mitchell
Dore, Noel Etienne	M.S.	1939	
Dostal, Diana L.	M.S.	1990	Cameron
Dostal, Herbert C.	M.S.	1962	Kenworthy
Dostal, Herbert C.	Ph.D.	1963	Carlson, R.
Dosfal, John*	M.S.	1962	Mitchell
Doud, Steven Lorne	Ph.D.	1974	Carlson, R.
Doud, Steven Lorne	M.S.	1971	Carlson, R.
Downes, John Dixon	Ph.D.	1955	Carolus
Downey, Suzanne Lynn	MS	1999	Iezzoni
Drain, Brooks Daniel	Ph.D.	1933	
Driscoll (Monroe), Elizabeth	Ph.D	2004	Lownds
Drost, Daniel Thomas	M.S.	1983	Price
Duck, Marcus Wayne	M.S.	2002	Cregg
Duell, Pritam Singh	M.S.	1933	
Duffy, Robin Kay	M.S.	1982	Ewart
Duggirala, Satyadev	MS	1978	Price
Dunbar, Donald Arthur	M.S.	1968	Carlson, W.
Dunham, Charles Warren	Ph.D.	1955	Hamner/Asen
Durhman, Angela Keri	M.S.	2005	Rowe
Durso, Marcia	M.S.	1976	De Hertogh
Dwyer, Jennifer Leigh	M.S.	1995	Peterson, N.C.
Dykeman, Brian W.	M.S.	1975	Davidson
Eades, Janice E.	M.S.	1956	Hamner
Eckert, James A.	M.S.	1966	Mitchell
Eding, Ronald G.*	M.S.	1967	Nicklow
Edson, Charles Edward8	M.S.	1986	Flore
Edson, Charles Edward8	Ph.D.	1991	Howell
Efron, Paul M.	M.S.	1952	
Eggert, Dean A.	M.S.	1961	Mitchell
Eggert, Dean A.	Ph.D.	1964	Mitchell
Eggert, Russell L.	M.S.	1939	
Ehert, Gail	M.S.	1975	Andersen
Eisenberg, Kenneth C.*	M.S.	1978	Andersen
Ekanayake, E M D S Nalin	M.S.	1993	
El-Shawaf, Ibrahim	Ph.D.	1979	Baker
Elboudwarej, Fakher	PHD	1991	Herner
Elliott, Marshall J.*	M.S.	1983	Dilley
Ellis, Nathan K.	Ph.D.	1950	Lucas

Name	Degree	Year	Major Prof
Ells, James Earnest Ellis	M.S.	1958	Carolus
Ells, James Earnest Ellis	Ph.D.	1961	Carolus
Elser, Arlon Ervin	M.S.	1961	Carolus
Elser, Arlon Ervin	Ph.D.	1964	Carolus
Elson, Marshall Kent	Ph.D.	1993	Kelly
El-Tamzini, Mohamed	M.S.	1972	Dewey
Emino, Everett Raymond	M.S.	1967	Sink
Emino, Everett Raymond	Ph.D.	1972	Rasmussen
Enfield, Amy Lynn	M.S.	2002	Heins
Engelkes, Cheryl Ann	M.S.	1987	Widders
Engle, Beth Etta	M.S.	1994	Cameron
Erickson, Andrew John	M.S.	1999	Nair
Erickson, Virginia L.*	M.S.	1979	Carlson, W.
Erwin, John Enos	M.S.	1986	Heins
Erwin, John Enos	Ph.D.	1991	Heins
Escamilla-Santana, Hector Mauricio	M.S.	1985	Howell
Eustace, John	M.S.	1911	
Evans, George E.	M.S.	1965	Rasmussen
Evans, George E.	Ph.D.	1969	Rasmussen
Fang, Guowei	Ph.D.	1992	Grumet
Farish, Lee Roy	M.S.	1933	
Fausey, Beth Anne	M.S.	1999	Heins
Fausey, Beth Anne	Ph.D.	2005	Cameron
Faust, James Emerson	M.S.	1992	Heins
Faust, James Emerson	Ph.D.	1995	Heins
Ferenczi, Alejandra	MS	2003	Beaudry
Fernandes, Regina Rosa	Ph.D.	1991	Widders
Fernandez, Alexander	M.S.	1994	Schutzki
Fernandez, Jose Miguel	M.S.	1970	Nicklow
Fernandez, Rodney Thomas	Ph.D.	1992	Perry
Ferrarese, Michell	M.S.	2005	Biernbaum
Ferrari, Thomas Enrico	Ph.D.	1970	De Hertogh
Feucht, James Roger	M.S.	1957	Watson
Feucht, James Roger	Ph.D.	1960	Watson
Finical, Leslie Marie	M.S.	1998	Cameron
Finn, James Crampon Jr.*	M.S.	1953	
Fischer, Charles Clayton*	M.S.	1956	Watson
Fisher, Durwood Frederick	M.S.	1917	
Fisher, J. W.	M.S.	1914	
Fisher, Paul R	Ph.D.	1995	Heins
Fisher, Vernon Jacob	Ph.D.	1950	
Flint, Harrison Leigh	M.S.	1952	Asen
Flore, James Albert*	M.S.	1973	Bukovac
Flore, James Albert*	Ph.D.	1974	Bukovac
Flores, Flores L.	M.S.	1973	Mecklenburg
Fonda, Harold H.	M.S.	1982	Heins
Ford-Logan, Jane Laverne	Ph.D.	1987	Sink
Fouch, Stephen Bruce	M.S.	1987	Kesner/Perry
Fountain, Charles Allen	M.S.	1948	
Fountain, Charles Allen	Ph.D.	1957	Hamner
Fragu, Michael A.	M.S.	1974	
Frane, Alison Jean	M.S.	1999	Carlson, W.
Fries, Harry H.	M.S.	1964	Wittwer
Fritz, Vincent Arthur	M.S.	1982	Honma
Fritz, Vincent Arthur	Ph.D.	1986	Honma
Fuhr, Elmer John*	M.S.	1947	
Fuhr, Elmer John*	Ph.D.	1955	
Fuller, Charles*	M.S.	1930	
Furutani, Sheldon Chris	Ph.D.	1982	Zandstra
Gamble, Stanley Joseph*	M.S.	1958	Kenworthy
Gamble, Stanley Joseph*	Ph.D.	1963	Kenworthy
Garcia, Jose Luis Moreira	M.S.	1980	Dilley
Garcia, Rafael Amezquita	Ph.D.	1972	
Gartner, John Bernard	M.S.	1948	
Gartner, John Bernard	Ph.D.	1952	
Garton, Ronald W	M.S.	1988	Widders
Gaston, Harold Paul	M.S.	1927	
Gavrilis, Dimitris George.	M.S.	1983	Carlson, W.
George, Renee K	M.S.	1990	Biernbaum
Gerakis, Pantazis Alexandros A.	M.S.	1966	Markarian
Gerakis, Pantazis Alexandros A.	Ph.D.	1968	Honma
Gerson, Robert	M.S.	1977	Honma
Ghaderi, Ardeshir	M.S.	1966	Markarian
Giannopolitus, Constantinos N.	Ph.D.	1976	Ries
Gibson, Edmund Harrison	M.S.	1919	
Gilbart, David Allen	M.S.	1963	Kenworthy
Gilbart, David Allen	Ph.D.	1969	Sink
Gilmore, John E.*	M.S.	1962	Mitchell
Glady, Janelle Elizabeth	Ph.D	2004	Lang, S.
Godden, Brenda F.	M.S.	1962	Watson
Gogue, George J.	Ph.D.	1973	Rasmussen
Goldy, Ronald G.	M.S.	1980	Andersen
Gonderman, Robert L.	Ph.D.	1962	Haney
Gonzalez-Ramirez, Alfredo	M.S.	1971	Herner
Goodin, Joe Ray	M.S.	1958	Watson
Gortzig, Carl Frank	Ph.D.	1976	Kenworthy
Graham, Donald James	M.S.	1959	Kenworthy
Grajauskis, Jerome Joseph*	M.S.	1990	Price
Gran, Christopher David	M.S.	1993	Beaudry
Gray, George Franklin	Ph.D.	1933	
Green, Edward Clarence*	M.S.	1913	Hon.
Greene, Duane Wesley	M.S.	1966	Bukovac
Greene, Duane Wesley	Ph.D.	1969	Bukovac
Greer, Catherine Elaine	M.S.	1994	Schutzki
Gruber, Susan Marie*	M.S.	1992	Peterson, N. C.
Gruesbeck, Ronald Von	M.S.	1990	Zandstra
Grumet, Rebecca	M.S.	1980	Fobes
Grumet, Rebecca	Ph.D.	1985	Dilley/A. Hanson
Gubbels, Gerald H.	Ph.D.	1967	Kenworthy
Gucci, Riccardo	Ph.D.	1988	Flore
Guido, Sergio Ricardo	M.S.	1998	Zandstra
Guo, Shuangling	M.S.	1991	Zandstra
Gupta, Uma Shanker	Ph.D.	1993	Ewart
Haile-Mariam, Samu-Negus	Ph.D.	1965	Wittwer
Halliday, William Gilmore Jr.	M.S.	1952	Watson
Hamaker, Cheryl K	M.S.	1998	W. Carlson
Hamilton, Carl Alexander	M.S.	1949	
Hamilton, Randal L	M.S.	1987	Iezzoni
Hammond, June L.	M.S.	1949	
Hammond, Kent D.	M.S.	1974	Davidson
Han, Yun-teh	Ph.D.	1963	Krone
Hanan, Julia Watkins	M.S.	1956	Krone
Hanchek, Anne Marie Richards	Ph.D.	1989	Cameron
Hangarter, Roger Paul	M.S.	1977	Ries
Hansen, Eric Norton	M.S.	1971	Carpenter
Hard, Cecil Gustav*	M.S.	1952	Watson
Hard, Cecil Gustav*	Ph.D.	1955	Watson
Harmon, John Syler*	M.S.	1957	Watson
Harmond, Edward H.	M.S.	1945	
Harrington, Cheryl M.	M.S.	1970	Taylor

Name	Degree	Year	Major Prof
Harris, Norman	M.S.	1960	Kenworthy
Harrison, Thomas Brian	M.S.	1939	
Hartman, Simon B.	M.S.	1910	Hon.
Hartung, Anne E	Ph.D.	1987	Putnam
Harwood, Richard Roland	M.S.	1966	Markarian
Harwood, Richard Roland.	Ph.D.	1967	Markarian
Hassett, Karen D.*	M.S.	1981	Fobes
Hastings, Wm. Grant	M.S.	1932	
Hatch, Robert L.	M.S.	1973	Rasmussen
Hauck, Nathaniel R.	Ph.D	2004	Iezonni
Hausbeck, Mary Kay*	M.S.	1985	Heins
Hayden, Mary	M.S.	1982	Ewart
Heiden, Ralph W	M.S.	1987	Cameron
Hemaidan, Nassib M.	M.S.	1952	
Herison, Catur	M.S.	1991	Zandstra
Hert, Ernest	M/S.	1920	
Herzel, Rudolph W.	M.S.	1954	
Heslip, Robert Paul*	M.S.	1959	Carolus
Hesse, Peter Standish	M.S.	1977	Honma
Hewetson, Frank Nutter	M.S.	1936	
Hewetson, Frank Nutter	Ph.D.	1953	Kenworthy
Hicks, Jessica Marie	M.S.	2005	Behe
Higaki, Tadashi	Ph.D.	1977	Rasmussen
Higdon, Roscoe John	M.S.	1951	Kenworthy
Higdon, Roscoe John	Ph.D.	1953	Kenworthy
Hillig, Karl William	M.S.	1988	Iezzoni
Hillyer, Irvin G.	Ph.D.	1956	Wittwer
Hirzel, Rudolph William	M.S.	1955	Bedford
Hodge, William V.	M.S.	1959	
Hodupp, Richard Martin	M.S.	1983	Putnam
Hoffman, Melvin Butler	M.S.	1926	
Hokanson, Karen Elizabeth	Ph.D.	1995	Hancock
Hokanson, Stan C	M.S.	1991	Hancock
Hokanson, Stan C	Ph.D.	1995	Hancock
Holley, Winfred O.	M.S.	1940	
Hong, Wang	Ph.D.	1991	Herner
Hooks, Ronald Fred	Ph.D.	1969	Kenworthy
Hooper, Calvin C.	Ph.D.	1954	
Hopen, Herbert J.	Ph.D.	1962	Ries
Hopper, Douglas A *	M.S.	1985	Carlson, W.
Hopping, Murray Edwin	Ph.D.	1972	Bukovac
Hossain, Syed Md. Monowar	Ph.D.	1984	Price
Houck, Glenn A.	M.S.	1940	
Houle, Mary Ellen	M.S.	1984	Flore
Houtz, Robert L	Ph.D.	1985	Ries
Houtz, Robert L.	M.S.	1980	Ries
Howell, John Teekay	M.S.	1952	Carolus
Howell, Monticello Jefferson	M.S.	1956	Wittwer
Howland, Joseph Emery	M.S.	1942	Wildon
Hoxsie, Clarence Elisha	M.S.	1933	
Hubbard, Mark Anthony	Ph.D.	1995	Flore
Hull, Jerome Jr.*	Ph.D.	1958	Hamner
Hunsperger, Mary Holt	M.S.	1981	Helsel
Huth, Joseph E.	M.S.	1965	Nicklow
Hyde, John W.	M.S.	1960	Davidson
Hyman, Elizabeth	M.S.	1980	
Igoe, Melissa Jane	M.S.	1991	Peterson, N.C.
Irey, William R.	M.S.	1950	
Irwin, Christine Cayer	M.S.	1980	Price
Irwin, Peter L.	Ph.D.	1981	Dilley

Name	Degree	Year	Major Prof
Isbell, Charles L.*	Ph.D.	1928	
Jackson, Hezekiah	M.S.	1947	
Jackson, Hezekiah	Ph.D.	1952	Wittwer
Jakway, James J	M.S.	1913	Honorary
Janoudi, Abdul-Kader Fouad	Ph.D.	1989	Widders
Jardine, Douglas Joseph*	M.S.	1977	Dilley/Price
Jasmin, Jean J.	M.S.	1951	Carolus
Jennings, Nancy Thompson*	M.S.	1976	De Hertogh
Jessup, James H.	M.S.	1955	
Jiang, Chunxiao	Ph.D.	1996	Sink
Jiang, Hongying	Ph.D.	2001	Howell
Johns, Charles Glenn*	M.S.	1955	Wittwer
Johnsen, Erik Moradsen	M.S.	1949	
Johnson, David Elwood	M.S.	1980	Howell
Johnson, John R.	M.S.	1950	
Johnson, Jonas E.	M.S.	1952	
Johnson, Timothy James	M.S.	1967	Dilley
Johnson, Timothy James	Ph.D.	1971	Dilley
Johnson, Wayne S.	M.S.	1973	Bukovac
Johnson, Wayne S.	Ph.D.	1979	Rasmussen
Johnston, Stanley*	M.S.	1930	
Joles, Dennis Wade	M.S.	1993	Cameron
Jonas, Genevieve Jean	M.S.	1955	Tukey
Jones, Carol*	M.S.	1961	Stinson
Jones, Douglas	M.S.	1972	Davidson
Jones, Grant	M.S.	2005	Cregg
Jordan, Benjamin	M.S.	1960	Paris, C.D.
Jorgensen, Carl Jens C.	M.S.	1946	
Juchartz, Donald Daniel*	M.S.	1959	Haney
Jyung, Woon Heng	M.S.	1959	Wittwer
Jyung, Woon Heng	Ph.D.	1963	Wittwer
Kabelka, Eileen A.	M.S.	1996	Grumet
Kaczperski, Mark Paul*	M.S.	1989	Carlson, W.
Kalishek, James E.	M.S.	1994	Schutzki
Kamps, Terry L*	M.S.	1986	Sink
Kann, Susan C.	Ph.D.	1991	Ewart
Kannan, Seshadri	Ph.D.	1966	Wittwer
Kappel, Frank	M.S.	1981	Flore
Kappes, Ewald Maximilian	Ph.D.	1986	Flore
Karas, James Glynn	M.S.	1958	Haney
Karas, James Glynn	Ph.D.	1962	Hamner, D.L.
and D.J. DeZeeuw ?			
Karlik, Jan	M.S.	1975	Taylor
Karlsson, Meriam G	Ph.D.	1987	Heins
Karlsson, Meriam G.	M.S.	1984	Heins
Karp, Robert Carl*	M.S.	1977	Sink
Kays, Sandra Elizabeth	M.S.	1969	Carlson, W.
Kays, Stanley J.	M.S.	1969	Carlson, W.
Kays, Stanley J.	Ph.D.	1971	Nicklow
Kays, William R.	M.S.	1940	
Keefer, Victor E.	M.S.	1945	
Kelley, Kathleen Marie	M.S.	1997	Peterson, N.C.
Kelley, Kathleen Marie	Ph.D.	2000	Behe
Kelly, Charles B.	M.S.	1946	
Kelly, James D.	Ph.D.	1957	Hamner
Kelly, John Francis*	M.S.	1957	Carolus
Kelly, Robert James*	M.S.	1977	
Kelm, Mark Allen	M.S.	1996	Nair
Kelm, Mark Allen	Ph.D.	1999	Nair
Keppeler, Harry W.	Ph.D.	1968	Lindstrom

Name	Degree	Year	Major Prof
Kerawala, Dade N.	Ph.D.	1968	Dewey
Kern, Kevin Carl	M.S.	2000	Carlson, W.
Kesner, Charles Douglas*	M.S.	1962	Kenworthy
Kesner, Charles Douglas*	Ph.D.	1966	Ries
Kessler, George Morton	Ph.D.	1953	Kenworthy
Ketsa, Saichol	Ph.D.	1980	Herner
Keyes, Katherine A.*	M.S.	1987	Honma
Khan, Abdul Hameed	M.S.	1952	
Khan, Amjad	M.S.	1993	Iezzoni
Kiang, Chi-kien	M.S.	1948	
Kiang, Chi-kien	Ph.D.	1950	Hamner
Kilby, Michael W.	Ph.D.	1971	Kenworthy
Kilyanek, Shannon L.	M.S.	1980	Krauskopf
Kimball, Donald Arthur	M.S.	1927	
Kimball, Keith H.	M.S.	1950	
Kiritsikas, Apostolis	M.S.	1970	Stine, C.M.
Kish, Teresa Elaine	M.S.	1986	Ries
Kitsos, Chrysostom C.	M.S.	1961	Kenworthy
Kivilaan, Alexander	Ph.D.	1957	Scheffer, Robt.
Klein, Isaac	M.S.	1965	Calson, R.
Klein, Isaac	Ph.D.	1969	Dilley
Klein, Joshua D.	Ph.D.	1983	Dewey
Klein, Rodney J.	M.S.	1984	
Klingbeil, George Carl*	M.S.	1950	Mitchell
Klobucher, Cindy	M.S.	1986	Cameron
Klomparens, Karl	M.S.	1950	Marshall
Klougart, Asger V.	M.S.	1958	Carolus
Knavel, Dean E.	Ph.D.	1959	Ballard, J.C.
Knight, Allen Thomas	M.S.	1941	Partridge
Knight, Allen Thomas	Ph.D.	1943	
Knoernschild, Robert	M.S.	1959	Kenworthy
Knowles, Norman Richard	M.S.	1980	Ries
Knowlton, Linda Lee	M.S.	1976	Sink
Kolker, Louise Solomon	M.S.	1978	Ries
Koukkari, Willard L.	M.S.	1959	Kenworthy
Krahl, Kimberly Howell	M.S.	1989	Iezzoni
Krahn, Thomas Richard	M.S.	1973	Herner
Krebs, Stephen Lindley	Ph.D.	1989	Hancock
Kretchman, Dale Warren*	M.S.	1954	Mitchell
Kretchman, Dale Warren*	Ph.D.	1958	Mitchell
Krishnamurthi, Sundaram	Ph.D.	1949	Tukey
Krizek, Allen Paton	M.S.	1974	Dewey
Kuai, Jianping	PHD	1992	Dilley
Kuo, Chungsniu ??	M.S.	1971	
Kurki, Lea Marjatta	M.S.	1955	Wittwer
Kwong, Shue Shan	Ph.D.	1954	Kenworthy
Lam, Chiu Ming	M.S.	1958	
Landgraf, John Elsmore	M.S.	1952	Hamner
Lane, Ronald P.	Ph.D.	1968	Peterson, C.E.
Lange, Diana Lynn Dostal	M.S.	1990	Cameron
Lange, Nathan E	M.S.	1993	Heins
Langer, Clarence Anton	M.S.	1948	Hamner
Langer, Clarence Anton	Ph.D.	1952	Tukey
Langvad, Bjarne Johan	M.S.	1955	Haney
Lansari, Ali	PHD	1993	Iezzoni
Larosa, Javier A.	M.S.	1972	Kenworthy
Larsen, Fenton E.	Ph.D.	1959	Moulton
Larsen, Robert Paul	Ph.D.	1955	Kenworthy
Lateer, Robert William	M.S.	1952	Haney
Lathrop, Judith K.	M.S.	1969	Mecklenburg

Name	Degree	Year	Major Prof
Layne, Desmond Richard	MS	1989	Flore
Layne, Desmond Richard	PHD	1992	Flore
Learner, Edward Norman	Ph.D.	1952	Wittwer
Lee, Jaemin	MS	1998	Ewart
Lee, Julian June-ling	M.S.	1973	Carlson, R.
Lee, Julian June-ling	Ph.D.	1979	Dewey
Lee, Shu-Hsien	M.S.	1947	Carolus
Leece, David Ronald	Ph.D.	1970	Kenworthy
Lefevre, Roy Edward	MS	1988	Peterson
Leon, Jose Miguel	M.S.	1976	Bukovac
Leon, Jose Miguel	Ph.D.	1980	Bukovac
Lester, Gene Edward	Ph.D.	1980	Kelly
Leuty, Stanley Josiah	M.S.	1962	Bukovac
Leuty, Stanley Josiah	Ph.D.	1964	Bukovac
Levi, Amnon	PHD	1990	Sink
Lewin, Isaac J.	M.S.	1964	Bukovac
Lewis, Lowell N.	M.S.	1958	Kenworthy
Lewis, Lowell N.	Ph.D.	1960	Kenworthy
Li, Kwoh-hsing	M.S.	1950	Bedford
Li, Liming	MS	1988	Dilley
Li, Ruh-meo	M.S.	1950	Marshall
Lin, Lok-chien	M.S.	1949	Watson
Lincoln, James E.	M.S.	1963	Larsen
Linderman, Sheila Dale*	MS	1988	Ewart
Lingle, John Clayton	Ph.D.	1955	Carolus
Lipsit, Ross R.	M.S.	1952	Mitchell
Lipton, Werner Jacob*	M.S.	1953	Carolus
Little, Holly	Ph.D.	2005	Grumet
Little, Mary Bennett.	M.S.	1957	Watson
Liu, Bin	Ph.D.	1999	Heins
Liu, Jane Ryol	Ph.D.	1982	Sink
Liu, Pei-ying	M.S.	1949	
Lockerman, Ronald Hollis	Ph.D.	1977	Putnam
Lockhart, James Arthur*	M.S.	1951	Hamner
Lombard, Porter Bronson	Ph.D.	1958	Mitchell
Lombardini, Leonardo	Ph.D.	1999	Flore
Lone, James W.*	M.S.	1959	Carolus
Long, Christopher Michael	M.S.	1994	Iezzoni
Long, Jean Marie*	M.S.	1987	Widders
Long, Stephen Michael	M.S.	1980	Flore
Lonsway, James R.	M.S.	1957	Krone
Lopez, Roberto Gerardo	M.S.	2003	Runkle
Lougheed, Everett C.	Ph.D.	1964	Dewey
Loutfi, Salah M.	M.S.	1951	
Loutfi, Salah M.	Ph.D.	1953	Bedford
Lownds, Norman Keith*	M.S.	1984	Bukovac
Lownds, Norman Keith*	Ph.D.	1987	Bukovac
Lumis, Glen Pierce	M.S.	1966	Davidson
Lumis, Glen Pierce	Ph.D.	1970	Mecklenburg
Luo, Cheng	Ph.D.	1997	Ewart
Lyon, Theodatus Timothy	M.S.	1891	Hon.
Machacek, Clifford	M.S.	1955	Kenworthy
Machado, Marcia L.*	M.S.	1979	Baker
MacLean, Dennis Cameron	M.S.	1962	Davidson
MacLean, Dennis Cameron	Ph.D.	1965	Dilley
Madjid, Abdul	Ph.D.	1981	Fobes
Magnani, Marcio	M.S.	1977	Bukovac
Maguylo, Karen	M.S.	2003	Lang, G.
Mahhou, Ahmed	Ph.D.	1991	Dennis
Mahlstede, John Peter	M.S.	1948	

Name	Degree	Year	Major Prof
Mahlstede, John Peter	Ph.D.	1950	Watson
Mahoney, Charles Harold	Ph.D.	1931	
Mahotiere, Sauveur	Ph.D.	1972	Herner
Macaraci, Ahmet Zafer	Ph.D.	2003	Flore
Makoni, Rufaro Magnus	M.S.	1989	Herner
Makus, Donald J.	M.S.	1966	Kenworthy
Mandigo, Jerry Hampton	M.S.	1954	
Mandoga, Reginald Nhamo	M.S.	1987	Perry
Mandujano, Mario R	M.S.	1995	Dennis
Mansfield, Timothy Kenneth*	M.S.	1979	Howell
Mansour, Nabeel S.	Ph.D.	1966	Honma
Maqbool, Muhammad	M.S.	1986	Cameron
Mark, Lester Elliott	M.S.	1946	
Marquez-Borchardt, Jorge	M.S.	1982	
Martin, Barry A. *	M.S.	1976	Herner
Martin, Dudley Carl	Ph.D.	1955	Wittwer
Martin, Lloyd Wayne	Ph.D.	1967	Hull
Martin, William T.	M.S.	1982	Ries
Masabni, Joseph Gebran	M.S.	1989	Dennis
Masabni, Joseph Gebran	Ph.D.	1998	Zandstra
Masarirambi, Michael T	M.S.	1989	Herner
Matasch, Leonard L.	M.S.	1957	
Mathers, Hannah Mary	Ph.D.	1997	Iezzoni
Matsumoto, Dan K.	M.S.	1961	Kenworthy
Mattson, Edward Rae	M.S.	1953	
May, Roger A	Ph.D.	1997	Sink
Mayberry, Bennie Douglas	M.S.	1949	Wittwer
Mayberry, Bennie Douglas	Ph.D.	1951	Wittwer
Mayne, Eric	M.S.	1957	Dewey
McCaffery, Michael W.	M.S.	1986	Honma
McCammon, Kenneth R.	M.S.	1982	Honma
McCammon, Kenneth R.	Ph.D.	1983	Honma
McCarthy, Charles J.	M.S.	1950	Carolus
McClintock, James A.	Ph.D.	1944	
McFaddin, Norman Jeff Jr.	M.S.	1967	Sefick ?
McGuffey, William Carl	M.S.	1949	Carolus
McHatton, Thomas Hubbard	M.S.	1923	
McKeown, Alan W.	Ph.D.	1982	Ries
McLain, Dennis A.	M.S.	1966	Kenworthy
McLean, Ian Bruce	M.S.	1979	Rasmussen
McLean, Ian Bruce	Ph.D.	1981	Kelly
McLean, Robert Michael	Ph.D.	1993	Howell
McManus, George Alvin, Jr.*	M.S.	1953	Kenworthy
McMeekin, Alphonso Lorenzo	M.S.	1941	
McReynolds, William D. Jr.	Ph.D.	1972	Putnam
McVey, George Randall	M.S.	1958	Wittwer
McVey, George Randall	Ph.D.	1961	Wittwer
Mead, Jon A.*	M.S.	1966	Bukovac
Medagoda, Indrani	M.S.	1993	Perry
Medina-Mora, Alberto Miguel E	M.S.	1988	Price
Medlock, Olin Campbell	M.S.	1927	
Megilley, Brian W.	M.S.	1967	
Mero, Carl Eugene, Jr.	M.S.	1981	Honma
Mero, Carl Eugene, Jr.	Ph.D.	1983	Honma
Merrill, Thais, Abia	M.S.	1933	
Merrill, Thais, Abia	Ph.D.	1954	
Messenger, Stacy Lynn	M.S.	2000	Lownds
Middleton, Alan L.*	M.S.	1965	Kenworthy
Mielke, Eugene Albert	M.S.	1970	Dennis
Mielke, Eugene Albert	Ph.D.	1974	Dennis
Mikkelsen, Edward Paul	M.S.	1976	Sink
Mikkelsen, Edward Paul	Ph.D.	1978	Sink
Milbocker, Daniel C.*	M.S.	1966	Sink
Mildner, Roland A.*	M.S.	1960	
Miles, Jennifer Elizabeth C.	M.S.	1998	Nair
Miller, Conrad Henry.	Ph.D.	1957	Carolus
Miller, David Philip	M.S.	1986	Howell
Miller, David Philip	Ph.D.	1996	Howell
Miller, Julian C., Jr.	Ph.D.	1972	Baker
Miller, Knudt John	Ph.D.	1970	Downes
Miller, Michael Barr	M.S.	1978	Dennis
Miller, Steven H.	M.S.	1984	Heins
Miranda, Ricardo Motta	M.S.	1979	Carlson, W.
Miranda, Ricardo Motta	Ph.D.	1981	Carlson, W.
Mitchell, Michelle K.*	M.S.	1982	Price
Mitchell, William D.	Ph.D.	1962	Wittwer
Mitterling, Lloyd Alfred*	M.S.	1955	Hamner
Moerland, Abraham	M.S.	1970	Carlson, R.
Mokoena, Phindiwe Keletso N	M.S.	1996	Kelly
Momin, Rafikali Alimahmad	Ph.D.	2000	Nair
Monterusso, Michael Anthony	M.S.	2003	Rowe
Moon, John Whitfield Jr.	M.S.	1981	Fobes
Moon, John Whitfield Jr.	Ph.D.	1985	Flore
Moore, Elizabeth Hyman	M.S.	2000	Behe
Moore, Ivon Lamar	Ph.D.	1954	Wittwer
Moore, James Garfield*	M.S.	1905	Hon.
Morrill, Roland	M.S.	1895	Hon.
Morris, George Damian	M.S.	1977	Ries
Morris, Thomas Vivian	M.S.	1949	Carolus
Morrison, Frank D.	Ph.D.	1966	Ries
Morrison, Mary-Slade	M.S.	1999	Biernbaum
Morse, Ronald Dean	Ph.D.	1971	Bukovac
Moser, Bruno C.*	M.S.	1964	Hamner
Motts, George Newton	Ph.D.	1931	
Moulton, James A.	M.S.	1955	
Moxley, Luther	M.S.	1973	Davidson
Msokar, Hamed R. E.	M.S.	1966	Markarian
Mueller, Sherry Annette	M.S.	1992	
Mulinix, Colleen Ann	M.S.	1987	Iezzoni
Mulvaney, Thomas R.	M.S.	1959	Pflug
Murphy, Dwight Douglas	M.S.	1947	
Murphy, Dwight Douglas	Ph.D.	1950	Hamner
Murphy, Lyle Moyer	M.S.	1939	
Naegele, Elizabeth M	M.S.	1979	Taylor
Nail, William	Ph.D.	2003	Howell
Nandgaonkar, Anand Keshav	M.S.	1981	Kelly
Narasimham, Kuchibhatla L.	M.S.	1953	Bedford
Narasimham, Kuchibhatla L.	Ph.D.	1954	Bedford
Natarella, Nicholas Joseph	M.S.	1969	Sink
Natarella, Nicholas Joseph	Ph.D.	1972	Sink
Neal, Oliver M. Jr.	Ph.D.	1956	Kenworthy
Neibauer, James E.	M.S.	1974	Herner
Neibauer, James E.	Ph.D.	1975	Herner
Neilsen, John Calvin	M.S.	1991	Dennis
Neilsen, John Calvin	Ph.D.	1998	Dennis
Neitzke, Virginia L.	M.S.	1979	Carlson, W.
Nell, Terril Arnold	Ph.D.	1977	Rasmu/Carp.
Nelson, Louella Jane*	M.S.	1984	Carlson, W.
Nelson, Stuart Harper	Ph.D.	1955	Tukey
New, Earl H.	Ph.D.	1961	Krone

Name	Degree	Year	Major Prof
Newport, Shawn Otis	M.S.	1995	Carlson, W.
Newsom, Donald Wilson	Ph.D.	1952	Carolus
Nichols, John Powell	M.S.	1965	Dewey
Niedz, Randall P.	M.S.	1983	Sink
Niedz, Randall P	Ph.D.	1987	Sink
Nikoloudi, Adriana	Ph.D.	2003	Flore
Nodenes, Martin	M.S.	1969	Herner
Norman, Laverne Andrew*	M.S.	1983	
Norton, Robert Alan	Ph.D.	1955	Tukey/Wittwer
Nuttall, Richard S. *	M.S.	1956	Watson
Nyberg, Gerald L.*	M.S.	1973	Taylor
Obenauf, Gary L	M.S.	1971	Dewey
Oberly, Gene H.	Ph.D.	1960	Kenworthy
Ohair, Stephen K.	M.S.	1972	Baker
Ohlander, Margret C.	M.S.	1950	
Olien, William Charles	M.S.	1976	Bukovac
Olien, William Charles	Ph.D.	1980	Bukovac
Olmstead, Mercy Ann	Ph.D.	2004	Lang, S.
Olney, Albert Jackson	M.S.	1920	
Olney, Arthur J.	M.S.	1965	Davidson
Olney, Arthur J.	Ph.D.	1969	Davidson
Olney, Clinton	M.S.	1920	
Olson, Alan F.	M.S.	1958	
Ombogo, Naftal Ondabu	M.S.	1995	Iezzoni
O'Rear, Lisa Ann	Ph.D.	1982	Flore
Osborn, Chad B.	M.S.	2003	Hancock
Otero, Alvaro Ricardo	M.S.	1994	Perry
Othman, Kamariah	M.S.	1985	Bittenbender
Otto, Harold W.*	M.S.	1966	Carolus
Owczarzak, Linda A	M.S.	1988	Zandstra
Owen, Frank W.*	M.S.	1952	
Owens, Christorpher I.	Ph.D.	2002	Iezzoni
Ozaki, Henry Yoshio	Ph.D.	1954	
Ozga, Jocelyn Ann	M.S.	1983	Sink
Ozga, Jocelyn Ann	Ph.D.	1989	Dennis
Pagano, Gregory Paul	M.S.	1971	Carolus
Pagano, Gregory Paul	Ph.D.	1974	Putnam
Palenick, Mary A.*	M.S.	1984	Perry
Palmer, Clinton Orville*	M.S.	1949	Wittwer
Pan, Shi Feng	M.S.	1989	Ewart
Pan, Shi Feng	Ph.D.	1992	Ewart
Pandian, Vijai Kumar	M.S.	2005	Zandstra
Papadopoulos, Christos N.	M.S.	1976	Hull
Papadopoulou, Ekaterini	Ph.D.	2002	Grumet
Parham, Price Hansel	Ph.D.	1969	Mitchell
Parikh, Satish P.	M.S.	1952	
Paris, Clark D.	Ph.D.	1956	Haney
Parker, Michael Lee	M.S.	1985	Flore/Dewey
Parker, Michael Lee	Ph.D.	1990	Hull
Parrott, James Francis	M.S.	1981	Kelly
Parups, Edwin Villis	Ph.D.	1955	Kenworthy
Parvin, Phillip Eugene	Ph.D.	1965	Krone
Passiatore, Joan Elizabeth	M.S.	1980	Sink
Passon, David E.	M.S.	1969	Kenworthy
Paterson, Donald R.	Ph.D.	1952	Wittwer
Paulsen, Michael David	M.S.	1965	Krone
Peacock, Neal D.	Ph.D.	1937	
Peng, Chang Hu	M.S.	1962	Stinson
Perez-Brennan, Rufino	M.S.	1994	Beaudry
Perez-Brennan, Rufino	Ph.D.	1998	Beaudry
Perkins, Ralph T. III*	M.S.	1983	Ewart
Peterson, Barbara*	M.S.	1985	Ewart
Petracek, Peter Donald	Ph.D.	1991	Bukovac
Pett, Walter Lee	M.S.	1986	Cameron
Phatak, Sharad Chintaman	Ph.D.	1964	Wittwer
Phillip, Michael John	Ph.D.	1964	Honma
Phillips, Richard L.	M.S.	1962	Bukovac
Phillips, Richard L.	Ph.D.	1964	Bukovac
Pickett, Barzillai S.	Ph.D.	1940	
Pickett, Wm. Francis	Ph.D.	1935	
Pickford, Irvin Thomas*	M.S.	1919	
Pietsch, Grace M	M.S.	1993	Carlson, W.
Pike, Leonard Maxwell	Ph.D.	1967	Peterson, C.E.
Pino, Austin Lester*	M.S.	1923	
Pino, Austin Lester*	M.S.	1930	
Polley, Rex A.	M.S.	1979	
Pompey, James A.	M.S.	1950	
Ponder, Harry Glenn	Ph.D.	1975	Kenworthy
Poneleit, Loelle S	M.S.	1994	Dilley
Pontius, Gregory A.	M.S.	1982	
Porter, Alton Millett	M.S.	1932	
Porter, Alton Millett	Ph.D.	1936	
Pramuk, Lee Ann	M.S.	2003	Runkle
Price, Hugh C.	Ph.D.	1969	Putnam
Prichard, Lynn Ellis	M.S.	1989	Ries
Prince, Timothy A.	M.S.	1980	Herner
Prince, Timothy A.	Ph.D.	1983	Herner
Pritts, Marvin P.	Ph.D.	1984	Hancock
Proebsting, Edward L. Jr.	Ph.D.	1951	Kenworthy
Prugsakit, Kriengaak	M.S.	1972	
Pulver, Edward Lee	Ph.D.	1972	Ries
Putnam, Alan R.	M.S.	1963	Ries
Putnam, Alan R.	Ph.D.	1966	Ries
Qu, Luping	Ph.D.	1997	Hancock
Rahemi, Majid	M.S.	1977	Andersen
Rahemi, Majid	Ph.D.	1982	Andersen/Dennis
Rai, Gurbachan Singh	Ph.D.	1952	Hamner
Rajzer, Christopher J.*	M.S.	1977	Putnam
Raman, Priyadarshini	M.S.	2004	Nair
Ramirez, Vinicio	Ph.D.	1982	
Randhawa, Gurcharan Singh	Ph.D.	1949	Tukey
Randle, William M.	M.S.	1977	Honma
Rangarajan, Anasuya	M.S.	199?	Kelly
Rangarajan, Anusuya	Ph.D.	1995	Kelly
Rao, Suradaneni Nageswara	Ph.D.	1954	Wittwer
Rappaport, Lawrence	M.S.	1951	Carolus
Rappaport, Lawrence	Ph.D.	1956	Wittwer
Rappe, Agneta Amorina	M.S.	1952	
Rasmussen, Harry Paul	M.S.	1962	Bukovac
Rasmussen, Harry Paul	Ph.D.	1965	Bukovac
Rawson, Jessie Melvin	M.S.	1948	
Reardon, Emily	M.S.	2005	Biernbaum
Reath, Alexander Norman*	M.S.	1953	Carolus
Reed, Clarence Arthur*	M.S.	1913	Hon.
Reikels, Jerald Wayne*	M.S.	1960	Carolus
Reiter, Richard	M.S.	1963	Mitchell
Retamales, Jorge B.	M.S.	1985	Bukovac
Retamales, Jorge B.	Ph.D.	1988	Hanson
Retzner, Helen Anita	M.S.	1981	Putnam
Reynolds, Henry G.*	M.S.	1893	Hon.

Name	Degree	Year	Major Prof
Rice, Douglas A.	M.S.	1968	
Rice, Robert P. Jr.	M.S.	1975	Putnam
Rice, Robert P. Jr.	Ph.D.	1977	Putnam
Richman, Terry Lee	M.S.	1979	Ries
Richmond, Amos	Ph.D.	1963	Dewey
Ricks, Glenn	M.S.	1933	Gardner
Ridley, Brent Lee	M.S.	1990	Sink
Riekels, Jerald Wayne	M.S.	1960	Carolus
Riley, Fred James*	M.S.	1956	Mitchell
Riley, James E.	Ph.D.	1979	Putnam
Ringuet, Jean	M.S.	1951	
Rios, Carmela	M.S.	2002	Cregg
Ripperda, James J.	M.S.	1975	Rasmussen?
Ripperda, James J.	Ph.D.	1978	Rasmussen/
Robbins, James A.	M.S.	1978	Spangler
Roberts, Alfred Nathan	Ph.D.	1953	Kenworthy
Roberts, Evan Paul	M.S.	1942	
Roberts, Evan Paul	Ph.D.	1958	Wildon
Robertson, Elizabeth Ann*	M.S.	1986	Ewart
Robinson, Kari Ann	M.S.	2002	Heins
Robitaille, Henry Arthur	M.S.	1967	Carlson, R.
Robitaille, Henry Arthur	Ph.D.	1970	Carlson, R.
Rodriguez, Reynaldo C.	Ph.D.	1969	Lindstrom
Rodriguez, Ortis Saulo J.	Ph.D.	1961	
Rodriquez, Enrique A.	M.S.	1964	Kenworthy
Rohwer. Charles Loyd	M.S.	2002	Heins
Rood, Paul Joseph*	M.S.	1950	Hamner
Rood, Paul Joseph*	Ph.D.	1953	Hamner
Rose, John William	M.S.	1948	Carolus
Ross, Mary K.*	M.S.	1976	Taylor
Roth, Geoffrey Nicholas	M.S.	1996	Nair
Roth-Stein, Cathy	M.S.	1996	Herner
Rowe, Phillip Ray	Ph.D.	1969	Baker
Ruiz, Marcelo Rodolpho	Ph.D.	1971	Carolus
Ruiz-Sifre, Gerardo V.	M.S.	1982	Ries
Rundle, Clare H.	M.S.	1939	
Runkle, Erik Sanford	M.S.	1996	Heins
Runkle, Erik Sanford	Ph.D.	2000	Heins
Rutherford, Walter Malcolm	M.S.	1954	Dewey
Rutland, Rufus Burr	M.S.	1960	Stinson
Rutland, Rufus Burr	Ph.D.	1965	Bukovac
Rutter, Sara Morey*	M.S.	1987	Sink
Sabath, Sheldon Robert	M.S.	1957	Bedford
Safi, Abdul Malik	M.S.	1961	Kenworthy
Sager, Wendell E.	M.S.	1968	
Saltveit, Mikal Endre Jr.	Ph.D.	1977	Dilley
Sams, Carl E.	Ph.D.	1980	Flore
Samuels, Clifford E.	M.S.	1955	Bedford
Sanford, David Lee	M.S.	1976	Carlson, W.
Sanford, David Lee	Ph.D.	19XX	Carpenter
Sanok, William John	M.S.	1972	Price
Sargent, Steven Alonzo*	M.S.	1979	Dewey
Satterlee, James	M.S.		
Scheuerman, Robert W.	M.S.	1958	
Schleussner, Otto William *	M.S.	1917	Carolus
Schmalfeld, Harold William	M.S.	1960	Carolus
Schmalfeld, Harold William	Ph.D.	1964	Carlson, W.
Schnabel, Jack H. * ??	M.S.	1975	Sink
Schnabelrauch, Linda S. D.	M.S.	1978	Sink
Schnabelrauch, Linda S. D.	Ph.D.	1982	Sink
Schoenherr, Jorg	M.S.	1969	Bukovac
Schoenherr, Jorg	Ph.D.	1972	Bukovac
Schueneman, Thomas J.*	M.S.	1971	Dewey
Schulte, Nancy L.	M.S.	1983	Hancock
Schultz, Joseph H.	M.S.	1942	
Schumacher, Stan C.	M.S.	1980	Heins
Schumann, Carol Marie	Ph.D.	1987	Hancock
Schwartz, John Frederick*	M.S.	1968	DeHertogh
Schweizer, Conrad Joseph	Ph.D.	1970	Ries
Scott, Ernest Wilbur	M.S.	1943	
Scott, John Warner	M.S.	1974	Baker
Scott, Leland Edwards	M.S.	1929	
Scott, Noreen B.	M.S.	1985	
Seaton, Henry Lyle	M.S.	1933	
Seelye, Duane Francis	M.S.	1953	Tukey
Serce, Sedat	Ph.D.	2002	Hancock
Seward, Harry L.	M.S.	1972	Ries
Sfakiotakis, Evangelos M.	M.S.	1970	Dilley
Sfakiotakis, Evangelos M.	Ph.D.	1972	Dilley
Shaller, Dean	M.S.	1965	Krone
Sharma, Ramesh Chandra	M.S.	1950	
Shen, Jane Yupei	M.S.	1956	Teubner
Shen, Jane Yupei	Ph.D.	1959	Teubner
Sherman, Carol	M.S.	1978	Spangler
Sherman, Robert Roger Jr.	M.S.	1971	Davidson
Sherman, Susan L.	M.S.	1983	
Sherwood, Charles Herbert	Ph.D.	1957	Hamner
Shirakawa, Takumi	M.S.	1963	
Shoemaker, Candice Ann*	M.S.	1983	Carlson, W.
Shoemaker, Candice Ann*	Ph.D.	1990	Carlson, W.
Shumack, Ronald Lee	Ph.D.	1972	Carlson, W.
Siefker, James Henry	Ph.D.	1985	Hancock
Sikkes, Alexander J.	M.S.	1969	Davidson
Silberstein, Otmar O.*	M.S.	1950	
Silsby, Lowell Howard	M.S.	1971	Mitchell
Silsby, Lowell Howard	Ph.D.	1974	Kenworthy
Silva, Silvanda De Melo	Ph.D.	1998	Beaudry
Silvia, Edward Louis	M.S.	1973	Putnam
Simons, Roy Kenneth	Ph.D.	1951	Kenworthy
Singer, Mary R.	M.S.	1984	
Singh, Atma	Ph.D.	1949	Lucas
Singh, Jag Pal	Ph.D.	1956	Hamner
Siriphong, Dusit	M.S.	1966	Davidson
Sitton, Benjamin Gaillard	M.S.	1928	
Sitton, Benjamin Gaillard	Ph.D.	1931	
Siu, Helen Nien-chuen	M.S.	1970	Sink
Sjulin, Thomas Martin	Ph.D.	1981	Andersen
Skrzynski, Jan	Ph.D.	1983	Dilley
Slezinski, James A.	M.S.	1973	Davidson
Smeda, Reid J.	M.S.	1984	Putnam
Smith, Carole A.	M.S.	1981	Taylor
Smith, David L.	M.S.	1971	
Smith, E.	M.S.	1917	
Smith, Elmer Denison	M.S.	1927	Hon.
Smith, Jeffrey Dean	M.S.	1988	Putnam
Smith, Michael W.	Ph.D.	1977	Kenworthy
Smith, Nancy E.	M.S.	1977	Taylor
Smith, Nicky Allen	M.S.	1948	
Smith, Nicky Allen	Ph.D.	1961	Carew
Smith, William Watson	Ph.D.	1935	

Name	Degree	Year	Major Prof
Smithyman, Russell Paul	M.S.	1994	Howell
Snell, Dennis A.	M.S.	1971	Davidson
Snyder, Grant Bingham	M.S.	1931	
Soeneadji	M.S.	1977	Herner
Sosa-Coronel, Jorge	M.S.	1974	Vest/Herner
Spangler, Ronald L.	Ph.D.	1971	Rasmussen
Sparks, Darrell	M.S.	1962	Larsen
Sparks, Darrell	Ph.D.	1965	Larsen
Spaulding, William J.	M.S.	1977	Kenworthy
Speakman, Thomas W.	M.S.	1967	
Spence, Janet G.	M.S.	1976	Carlson, W.
Sprecher, Susan Louise Morss	Ph.D.	1988	Sink/Adams
Srinivasan, Kallapatti M.	Ph.D.	1960	Honma
Staby, George Lester	M.S.	1967S	Stinson
Staby, George Lester	Ph.D.	1970	De Heertogh
Stallworth, Houston	M.S.	1947	Wittwer
Stanfield, Geoffrey H.	M.S.	1961	Kenworthy
Stanley, Leo Roswell	M.S.	1931	
Starcher, Glenn Raymond	M.S.	1931	
Steber, Jeanne	M.S.	1983	
Stebbins, Robert L.	Ph.D.	1970	Dewey
Stephenson, Gerald Robert	M.S.	1966	Ries
Stephenson, Gerald Robert	Ph.D.	1968	Ries
Stergios, Basil G.	M.S.	1970	Howell
Stergios, Basil G.	Ph.D.	1975	Howell
Sterling, Tracy Marie	M.S.	1986	Putnam
Stevens, Lewis F.*	M.S.	1951	
Stohrer, Joan	M.S.	2004	Hancock
Stoller, David	M.S.	1967	Lewis
Stone, John H.	M.S.	1967	
Storjohann, Bernhard, Jr.	M.S.	1956	Watson
Stout, G. J.	M.S.	1926	
Strand, Alfred Benjamin	M.S.	1928	
Striegler, R Keith	Ph.D.	1990	Howell
Stromme, Erling Rein	M.S.	1947	
Strong, Lester Robert	M.S.	1953	Bedford
Stuckey, Ben Nelson	M.S.	1939	
Stuckey, Ben Nelson	Ph.D.	1941	
Stuurwold, John Edward	M.S.	1977	Ries
Subramanya, Ramachandra	M.S.	1973	Vest
Subramanya, Ramachandra	Ph.D.	1977	Honma
Sultan, Mir Rasul	M.S.	1931	
Summers, William Lynn	Ph.D.	1977	Honma
Sun, Yue	M.S.	1996	Ewart
Sun, Yun-Teh	Ph.D.	1963	
Sweet, Dale Vernon*	M.S.	1953	Hamner
Sweet, Dale Vernon*	Ph.D.	1956	Hamner
Swindeman, Anne Michele*	M.S.	1986	Dilley
Takahara, Kiyomitsu	M.S.	1988	Putnam
Tasdighi, Mansoor	M.S.	1977	Herner
Tasdighi, Mansoor	Ph.D.	1980	Herner
Taylor, Alan George	M.S.	1977	Price
Taylor, James Lee	M.S.	1957	Widmoyer
Taylor, Michael James	M.S.	1972	Nicklow
Taylor, Oliver Clifton	Ph.D.	1953	Mitchell
Taylor, Steven	M.S.	1978	
Taylor, Susan Elizabeth*	M.S.	1977	Dewey
Teichman, Lynnelle E. *	M.S.	1986	Flore
Teng, Whei-Lan	Ph.D.	1990	Widders
Teran-de Marques, Norma	M.S.	1982	Heins
Tewfik, Mohamed Saleh	Ph.D.	2005	Grumet
Thienes, John R.	M.S.	1968	Larsen
Thompson, Barbara Lake	M.S.	1980	Dennis
Throop, Philip A	M.S.	1995	Hanson
Ticknor, Robert Lewis	Ph.D.	1954	Tukey
Tiessen, Herman	M.S.	1953	
Tiessen, Herman	Ph.D.	1956	Carolus
Toenjes, Walter	M.S.	1928	
Tolle, Leon Julius	Ph.D.	1964	Krone
Tomoyose, Choju	M.S.	1958	Carlson, R.
Tritten, Robert R.*	M.S.	1979	Davidson
Truax, Hartley Eugene*	M.S.	1917	
Tukey, Harold Bradford Jr.*	M.S.	1956	Tukey
Tukey, Harold Bradford Jr.*	Ph.D.	1958	Wittwer
Tukey, Loren Davenport	M.S.	1947	
Tukey, Ronald Bradford *	M.S.	1948	
Tuli, Virendra	M.S.	1961	Kenworthy
Tuli, Virendra	Ph.D.	1964	Wittwer
Turner, Carol Ann *	M.S.	1980	Carlson, W.
Tweedy, James Arthur	M.S.	1964	Ries
Tweedy, James Arthur	Ph.D.	1966	Ries
Uhl, Joseph N.	Ph.D.	1969	
Ullah, Zakir	Ph.D.	2000	Grumet
Unrath, Claude Richard*	M.S.	1966	Kenworthy
Unrath, Claude Richard*	Ph.D.	1968	Kenworthy
Uzcategui, Noe Alberto	M.S.	1978	Baker
Van Den Brink, Ceel	M.S.	1967	Kenworthy
Van Haarlem, Jacobus Roelof	M.S.	1927	
Van Hodge, William	M.S.	1959	Bedford
van Rooyen, Elzette	M.S.	2004	Beaudry
Vandermark, Joseph S.	M.S.	1946	Carolus
Vanstaaverem, Hendrikje	M.S.	1975	DeHertogh
VanWoert, Nicholaus	M.S.	2004	Rowe
Vareed, Shaiju K.	Ph.D.	2005	Nair
Vaugn, Moses William	M.S.	1949	Marshall
Vecino, Carlos A.	M.S.	1982	Dennis
Viale, Marcia Ann	M.S.	1955	
Vickery, Leo Stephen	M.S.	1942	
Vincent, David E.	M.S.	1980	
Vlachonasios, Konstantinos E	Ph.D.	1999	Dilley
Vodraska, Joseph D.	M.S.	1972	Hull
Vogt, John Parson	M.S.	1951	Bedford
Vos, Randall J.	M.S.	2003	Zabad/Hans
Vriesenga, Jerry Dale	M.S.	1968	Honma
Vriesenga, Jerry Dale	Ph.D.	1972	Honma
Wade, Gary	Ph.D.	1975	Grumet
Wai, Thanda	M.S.	1994	Grumet
Waldo, Geroge F.	M.S.	1926	
Wampfler, Daniel Joseph	M.S.	2003	Howell
Wan, Chee-Keong	Ph.D.	1980	Dennis
Wang, Dechun	M.S.	1994	Iezzoni
Wang, Dechun	Ph.D.	1998	Iezzoni
Wang, Haibo	Ph.D.	1998	Nair
Wang, Hong	Ph.D.	1991	Herner
Wang, Ji-Mei	M.S.	1992	Sink
Wang, Yichun	M.S.	1988	Ries
Wang, Xiaofeng	Ph.D.	2002	Grumet
Wang, Zhenyong	Ph.D.	1998	Dilley
Wardowski, Wilfred F. II *	M.S.	1961	Kenworthy
Wardowski, Wilfred F. II*	Ph.D.	1966	Mitchell

Name	Degree	Year	Major Prof
Waring, James	Ph.D.	1930	
Warren, William James	M.S.	1955	
Watson, Lewis P.	M.S.	1930	
Watson, William Leon	M.S.	1945	
Watson, William Leon	Ph.D.	1949	Hamner
Weddle, Charles Leonard	M.S.	1938	
Wei, An-Fu	M.S.	1948	.
Weigle, Jack Leroy	Ph.D.	1956	Peterson, C.E.
Weil, Marvin J.	Ph.D.	2003	Nair
Weiss, George M.	M.S.	1959	Tukey
Welch, Cindy Lorainne	M.S.	1988	Cameron
Welch, Norman C.	M.S.	1958	
Weldon, George Howard	M.S.	1941	
Wells, John M.	M.S.	1978	Bukovac
Wells, Otho Sylvester	M.S.	1963	Carolus
Welsh, Kent James	M.S.	1979	Sink
Welsh, Kent James	Ph.D.	1986	Sink
Werner, Dennis J.	M.S.	1975	Sink
Werner, Dennis J.	Ph.D.	1979	Honma
Werner, Georgina M. Malloy	M.S.	1977	Herner
Werner, Georgina M. Malloy	Ph.D.	1979	Putnam
Weston, Leslie Ann	M.S.	1982	Zandstra
Weston, Leslie Ann	Ph.D.	1986	Putnam
Whang, H. Arthur	M.S.	1957	Watson
Whitenack, Curt J	M.S.	1988	Putnam
Whitman, Catherine Margaret	M.S.	1995	Heins
Widmoyer, Fred Bixby Jr.	Ph.D.	1954	Watson
Wierzba (Watts), Kasey	M.S.	2004	Howell
Wigdor, Samuel	M.S.	1958	Stinson
Wikle, Jack Stanley	M.S.	1960	Watson
Wilde, John Everette	M.S.	1936	
Wiles, Martin J. Jr.*	M.S.	1968	Mitchell
Williams, Charles H.	M.S.	1967	De Hertogh
Williams, Laura Lee	M.S.	1975	Spangler
Willis, Michael Dean	Ph.D.	1983	Putnam
Wilson, Jill E.	M.S.	1969	Baker
Wilson, Jill E.	Ph.D.	1974	Baker
Wilson, Lorenzo George	Ph.D.	1969	Dewey
Winans, Constance L.	M.S.	1979	
Windham, Steve Lee	Ph.D.	1954	Carolus
Wittenbach, Vernon Arie*	M.S.	1970	Bukovac
Wittenbach, Vernon Arie*	Ph.D.	1974	Bukovac
Wolfe, David A.*	M.S.	1955	Kenworthy
Wolk, William D Jr	Ph.D.	1988	Dilley
Wolk, William D. Jr.	M.S.	1980	Herner
Wolpert, James Alan	M.S.	1978	Howell
Wolpert, James Alan	Ph.D.	1983	Howell
Wong, Cheong-Yin	Ph.D.	1939	
Wong, Melvin Keawe	Ph.D.	1971	Dennis
Wood, Timothy Duncan*	M.S.	1990	Cameron
Woodbury, George Wallis*	M.S.	1931	
Woodruff, Jasper Guy	Ph.D.	1932	
Woodruff, Richard Earl	Ph.D.	1959	Dewey
Work, Forrest Cleveland	M.S.	1931	
Worku, Zemedu	Ph.D.	1971	Carolus
Wright, Ivan	M.S.	1917	
Wright, Kimberly T.	M.S.	1984	
Wyma, Albertus A.	M.S.	1975	
Wu, Di	Ph.D.	2001	Nair
Xu, Yufei	M.S.	2005	Loescher
Yan, Bin	Ph.D.	2001	Widders
Yao, Jinpin	M.S.	1993	Nair
Yarger, Lawrence William*	M.S.	1980	Price
Ye, Weizhang	M.S.	1988	Dilley
Yelanich, Mark Vincent	M.S.	1991	Biernbaum
Yelanich, Mark Vincent	Ph.D.	1995	Biernbaum
Young, Roger Stacy	M.S.	1947	
Young, Roger Stacy	Ph.D.	1951	Tukey
Yu, Kyung Sang	Ph.D.	1971	Carlson, R.
Yuan, Mei	M.S.	1995	Carlson, W.
Zavalloni, Costanza	Ph.D.	2003	Flore
Zeidan, Tareq Mahmoud	M.S.	1997	Ewarrt
Zhang, Di	M.S.	1996	Nair
Zhu, Yali	M.S.	1994	Dilley
Zischke, Reva Doris	M.S.	1956	Watson
Zoppolo, Roberto Jose	Ph.D.	2004	Perry
Zucconi, Franco	Ph.D.	1975	Bukovac

* Also earned BS degrees

Appendix 5

Numbers of Degrees Awarded by the Horticulture Department by 10- or 5-year intervals [1]

Period	B.S.[2]	M.S.	Ph.D.	M.S.+ Ph.D.
1910-19	-	12	0	12
1920-29	-	19	3	22
1930-39	-	35	13	48
1940-45	-	19	5	24
1946-49	-	40	6	46
1950-54	65	62	45	107
1955-59	129	79	44	123
1960-64	85	48	37	85
1965-69	92	50	39	89
1970-74	167	62	46	108
1975-79	510	68	32	100
1980-84	432	61	32	93
1985-89	201	54	28	82
1990-94	136	52	28	80
1995-99	252	46	19	65
2000-05	331	42	28	70
Total	2400	749	40	1154

[1] Data approximate.
[2] Numbers for years prior to 1950 omitted because of insufficient data.

Appendix 6

Cultivars Released by the Department of Horticulture

FRUITS

Peach

Halehaven	1932	Johnston
Kalhaven	1938	Johnston
Redhaven	1946	Johnston
Fairhaven	1946	Johnston
Richhaven	1955	Johnston
Sunhaven	1955	Johnston
Suncling	1961	Johnston
Cresthaven	1963	Johnston
Glohaven	1963	Johnston
Jayhaven	1976	Johnston/Andersen
Spartancling	1976	Johnston/Andersen
Sweethaven	1976	Johnston/Andersen
Newhaven	1978	Johnston/Andersen/Moulton
Beaumont	2006	Shane/Iezzoni

Apple Rootstock

MARK	1982	Carlson

Apricot

Curtis		Johnston
Goldcot	1967	Johnston
Traverse	1978	Johnston/Andersen

Blueberry

Keweenaw	1951	Johnston
Bluehaven	1967	Moulton/Johnston
Northland	1967	Moulton/Johnston
Tophat	1977	Moulton/Johnston
Bluejay	1978	Moulton/Johnston
Aurora	2004	Hancock
Draper	2004	Hancock
Liberty	2004	Hancock

Pear

Spartlett	1972	Carlson

Strawberry

Scarlet	1978	Moulton

Raspberry

Early Red	1951	Moulton

VEGETABLES

Broccoli

S. Early	1960	

Carrot

MSU 1558*	1963	Peterson
MSU 3489*	1963	Peterson
Spartan Bonus	1969	Peterson & Baker
S. Sweet	1969	Baker ?
S. Delite	1971	Baker
S. Fancy	1971	Baker
MSU 1558A*	1971	Baker
MSU 1558B*	1971	Baker
MSU 5986B*	1971	Baker
S. North	1972	Baker
S. Classic	1976	Baker
S Premium	1976	Baker
S. Winner	1976	Baker
MSU 872A*	1976	Baker
MSU 872B*	1976	Baker
MSU 5988C*	1976	Baker
S. Delux	1977	Baker
S. Bonus 80	1981	Baker
S. Classic 80	1981	Baker
S. Delite 80	1981	Baker
S. Delux 80	1981	Baker
S. Fancy 80	1981	Baker
S.Premium80	1981	Baker
S. Winner 80	1981	Baker

Cauliflower

Green Ball	1971	Honma
Self-Blanche	1973	Honma
White Empress	1979	Honma
Stovepipe	1980	Honma

Celery

MI Golden	1933	Nelson ?
MI St. Green Gold	1951	
Spartan 162	1958	Honma
Golden Spartan	1974	Honma

* Asterisks indicate breeding lines.

Cucumber

Natl. Pickle	1929	
S. Dawn	1963	Peterson
S. Champion	1964	Peterson
S. Reserve	1964	Peterson
S. Progress	1967	Peterson
S. Advance	1968	Peterson/Baker
S. Valor	1968	Peterson/Baker?
S. Salad	1972	Baker
S. Jack	1973	Baker
S. Salad*	??	Baker
MSU 305 M*	??	Baker
MSU 183 C*	1973	Baker
S. Magic	1981	Baker
S. Pride	1981	Baker
S. Spirit	1981	Baker
S. Wonder	1981	Baker

Lettuce

Great Lakes	1942	Barrons/Whitaker
Tendergreen	1955	
S. Lakes	1968	Markarian
Chesibb	1969	Honma
Domineer	1972	Honma
Superbb	1980	Honma

Lima bean

S. Freezer	1968	

Muskmelon

Superb Golden	1939	Mahoney
Spartan Rock	1958	
MSU 1C*	1969	Baker

Onion

Mich. Sweet Spanish	1945	
Spartan	1957	Peterson
S. Era	1963	Peterson
S. Gem	1963	Peterson
S. Banner	1966	Peterson
S. Bounty	1966	Peterson
S. Sweet	1969	Peterson
S. Sleeper	1974	Peterson [at Wisconsin?]
S. Banner 80	1980	Peterson [at Wisconsin?]
Sweet Sandwich	1982	Peterson [at Wisconsin?]
S. Supreme	1997	Ewart

Pepper

Spartan Emerald	1964	Honma
S. Garnet	1968	Honma
Fromage	1972	Honma
Sonnette	1974	Honma
S. Ruler	1976 ?	Honma

Snap bean

Spartan Arrow	1963	Honma
S. Pride	1974	Honma
Green Ruler	1976	Honma
Golden Ruler	1979	Honma

Tomato

Victor	1941	Yeager
Early Chatham	1943	Bowser
Spartan Hybrid	1943	
Spartan Red 8	1961	Honma
Spartan Pink 10	1962	Honma
Moto-Red	1968	Honma
Droplet	1971	Honma
Rapids	1971	Honma
Mini-Spartan	1980	Honma

ORNAMENTALS

Kalanchoe

Michigan State	1942	Wildon

Snapdragon

Spartan Bronze	1952	Haney
S. Rose	1952	Haney
T. White	1952	Haney

Begonia

Spartan Beauty	1993	Ewart

Petunia

Mary Michie	1993	Ewart

Zinnia

Spartan Rainbow	1993	Ewart

Appendix 7

Some Honors and Awards Presented to MSU Faculty And Graduates

Only a few awards are included here, given (a) the number and diversity of the awards presented by MSU, and by local, state, national, and international organizations, and (b) the limited records for early years.

President of the American Society for Horticultural Science

1903-07	L. H. Bailey Jr.	B.S. 1882, Chair 1885-88
1913	U. P. Hedrick	B.S. 1893, M.S. 1895, Fac. '99-02; Chair 1902-05
1927	E. J. Kraus	B.S. 1907
1929	V.R. Gardner	B.S. 1905, Chair 1923-45
1936	A. Laurie	Faculty 1925-29
1941	F. C. Bradford	Faculty 1922-38
1947	H. B. Tukey, Sr.	Chair 1945-62
1951	A. F. Yeager	Faculty 1937-39
1952	K. Post	Faculty 1928-30
1965	L. P. Batjer	M.S. 1930
1966	H. J. Carew	Faculty 1947-62, Chair 1962-77
1968	N. W. Stuart	B.S. 1929
1971	A. L. Kenworthy	Faculty 1947-77
1972	J. P. Mahlstede	Ph.D. 1950
1975	M. J. Bukovac	B.S. 1951, M.S. 1954, Ph.D. 1957, Faculty 1957-96
1976	R. P. Larsen	Ph.D. 1955, Fac. 1955-68
1984	E. L. Proebsting, Jr.	Ph.D. 1951
1986	J. F. Kelly	B.S. 1953, M.S. 1956, Chair 1978-90

ASHS Hall of Fame

1990	L. H. Bailey, Jr.
1992	U. P. Hedrick
1994	E. J. Kraus
1996	H.B. Tukey, Sr.
1997	C. E. Peterson
1999	C. Hope
2001	M.J Bukovac
2001	S. Johnston
2004	S. H. Wittwer

MSU Distinguished Faculty Award

1965	S. H. Wittwer
1971	M. J. Bukovac *
1978	S. K. Ries.
1987	C. D. Kesner
1989	A. R. Putnam
1992	D. R. Dilley
1995	W. H. Carlson
2001	R. D. Heins

* Also University Distinguished Professor, 1992

Appendix 8

Staff Serving 10 Years or More

Here we recognize the many staff members who have provided the support required to maintain the work of both faculty and students. Without them, the Department would have been unable to provide the level of service it has rendered in teaching, research, and extension. We cannot recognize all staff members, but here we list all those who have served the University for 10 or more years, and/or as Secretary, or Administrative Associate, to the Chairman. Numbers in parentheses indicate the number of years that indivduals have served the University. Numbers following slashes indicate the total years served when indivuals were not employed by the Department for the full period.

Secretary to the Chairman

Barrret , Marian	1944-??
Burkhardt, Geraldine	19?? - 1970 ??
Ross, Marie	1970 - 1978
Jackson, Joyce	1979 - 2002
Mulvaney, Sherry	2002 - date

Administrative Associate

Ross, Marie	1978 - 1990
Busick, Lorri	1990 - date

10 or more years of service:

Allen, Sandra	(29/32)	11/73 - date
Baase, Jackie	(25)	1981 - date
Badgero, Douglas	(29)	1977 - date
Baughan, Rebecca	(22)	1983 - date
Blake, Gloria McKenney	(11/19)	1974 -93
Blakely, Norman	(15/16)	1967 - 83
Brown, Olin	(29)	1929 - 58
Busick, Lorri	(16-22)	1990 - date
Byler, Gail	(12/15)	1994 - date
Callow, Peter	(20)	1966 - date
Chase, Wm.	(27)	1979 - date
Damer, Hattie	(15)	1986 - 2001
DeYoung, Case	(13)	1988 - 99
DeYoung, Donna	(18)	1988 - date
Dittmer, Thomas	(13)	1988 - 2001
Ertman, James E.	(13)	1987 - 2000
Fader, Royal	(27)	1978 - 2006
Freeville, David	(24)	1982 - date
Gilmore, John	(37)	1962 - 99
Grejauskis, Jerry J.	(14)	1985 - 99
Hafer, Arnold	(27)	1958 - 85
Hammer, Sue	(18)	1988 - date
Hancock, Ann	(18/21)	1983 - date
Hayes, Terrie	(28/31)	1978 - date
Jackson, Joyce	(22/27)	1979 - 2002
Kent, LuAnn	(25)	1966 - 1992
Keyes, Carl	(20)	1958 - 1978
Khanh, Nguyen	(10)	1996 - date
Klein, Wm. M.	(23/24)	1983 - date
Lockwood, Amos	(22)	1956 - 1978
Masabni, Joseph G.	(12)	1990 - 2002
McCaul, David	(10)	1985 - 95
Miller, David P.	(12)	1985 - 97
Mulvaney, Sherry	(23/29)	1982 - date
Olrich, Michael	(11)	1995 - date
Pollock, Marshall	(30)	1973 - 2003
Priest, Wilbur	(18)	1972 - 90
Radke, Mildred	(13/15)	1969 - 82
Richey, Fred	(36)	1953 - 1990
Roback, Sharon	(36)	1970 - date
Ross, Marie	(25)	1965 - 90
Runkel, Joan	(13)	1988 - 2000
Skeltis, Gerry	(28)	1978 - date
Stanton, Thomas	(39)	1952 - 91
Storm, George	(15)	1967 - 82
Wert, Violet	(15/25)	1978 - 94
Winchell, Gary	(27)	1979 - date


Marie Ross


Joyce Jackson


Sherry Mulvaney


Lorri Busick

Appendix 9

District Horticultural Extension Agents

Name	MSU Degrees	Appointed	Resigned	Retired	District
Austin, Max E.	P64	1964	1965		SE
Bailey, Karl D.	B21	1949		1960	SE
Bittner, Richard F.*		1954			SW
Bradford, Larry J.	B65,M70	1962		1989	WC
Carpenter, W.S.		1961		1971	SW
Danilovich, Mira		1992	Current		WC
Delp, Russell T.		1948	1948		SE
Dennis, Gurdon K.		1965	1975		SE
Dennis, Gurdon K.*		1975			SE
Goldy, Ronald	M80	1996	Current		SW
Hemstreet, Carl H.	B23	1946	1951		NW
Hine, Donald *		1960	1951		SW
Kesner, Charles	B61,M62,P66	1965		1991	NW
Klackle, Frank	B44	1965		1981	WC
Lincoln, James E.	B55, M63	1965	1973		SE
Longstroth, Mark A.		1993	Current		SW
MacLean Wm. J. *		1971		1980	WC
Mandigo, Jerry H.	B34,M54	1948	1960		SW
McManus, George Jr.*	B52,M53	1964	1965		MW
Muller, William	B51	1974	1983		SE
Mullett, Clarence		1952		1964	NW
Neibauer, James	M74,P75			1996	SW
Nugent, James	B72	1991	Current		NW
Rajzer, Christopher J.	B76,M77	1989	1992		SW
Schwallier, Philip	B75	1978	Current		WC
Shane, William		1992	Current		SW
Siefert, Wayne B.		1962	1964		SE
Stachwick, G.T.		1957			WC
Stebbins, Theodore		1946	1947		SW
Tatter, Jordan B.		1972	1975		SW
Tatter, Jordan B *.		1975	1975		SW
Thomas, Theodore*	B61	1976		1993	SW
Tompkins, Lyle E.		1948	1964		WC
Tritten, Robert R.	B76,M79	1983	Current		SE
Trocke, John K. *		1976	1978		SE
Turk, Jacob A.*		1954	1957		

*District Horticultural Marketing Agent

Faculty and Staff – August 2005

Faculty

Row 1 *left to right*: R. Schutzki, M. Ngouajio, J. Flore, S. Snapp, N. Jiang, F. Dennis*, J. L. Taylor*, J. Saylor, I. Widders, N. Lownds, M. Nair, S. Lang.

Row 2: M. J. Bukovac*, M Duck, J. Biernbaum, T. Fernandez, R. Perry, J. Hancock, R. Grumet, B. Behe, R. Beaudry, K. Poff.

Row 3: W. Loescher, S. van Nocker, I. Aezzoni, B. Rowe, J. Kelly*, W. Carlson*, J. Taylor*, [L. H. Bailey], S. Ries*, D. Dilley*, J. Hull*, B. Zandstra, M. McLellan, R. Warner, E. Runkle.

Absent: A. Cameron, B.Cregg, B. Fails, E. Hanson, R. Heins*, R. Herner*, G. S. Howell, G. Kessler*, G. Lang, D. Schemske, K. Sink, T. Zabadal.

* Retired

Staff

Row 1 *left to right*: S. Dalavoy, J. Ek-Ramos, Wm. Chase, A. Mainguy, K. O'Neil, S. Roback, G. Tang, V. Vallejo, P. Callow, S. Allen, D. Bulkowski, J. Bolleddula, K. Munthu.

Row 2: F. Vallejo, M. Timm-Cook, S. Park, R. Baughan, S. Conley, D. Kort, B. Fausey, S. Hammar, C. Whitman, A. Hancock, J. Lockwood, T. Hayes, G.-Q. Song.

Row 3: D. Badgero, K. Lowrie, S. Morse, S. Berkheimer, P. Sabbatini, S. Brooks, M. Particka, G. Winchell, K. Nguyen, S. Mulvaney, L. Busick, G. Kambou.

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2	Prentiss, Albert N.	UA&HC
3	Beal, W. J.	UA&HC
4	Greenhouse built in 1874	UA&HC
4	Map of campus	Beal, 1915
5	Bottle for seeds	Mich. Sci. in Action No. 23, MAES May 1973
5	Satterlee, James	UA&HC
6	Bailey, Liberty Hyde Jr.	UA&HC
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12	Eustace, Harry J.	UA&HC
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91	Floriculture Forum 1952	Wolverine, p. 214
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Page numbers in bold italics indicate photographs. Pages in App. Tables 2 and 4 are not included here.

Appreciation for Financial Support

Our sincerest gratitude goes to the many friends and alumni of the Department of Horticulture who supported this project by providing information and moral support in its completion (see Foreword, p. iv.) .

Special recognition and appreciation are due the following individuals and organizations for generous financial support. (All are located in Michigan except for Fischer USA.)

==========

Fenn Valley Vineyards, Fennville

Fischer USA, Boulder, Colo.

Grand Traverse Fruit Growers Council, Williamsburg

Henry Mast Greenhouses, Inc., Byron Center

International Plant Management, Lawrence

Masterpiece Flower Co., L.L.C., Byron Center

Melanie Reinhold Foster, MSU Trustee and Horticulture Alumna, E. Lansing

MBG Marketing, Michigan Blueberry Growers Assoc., Grand Junction

Michigan Apple Committee, DeWitt

Michigan Cherry Committee, Lansing

Michigan Floriculture Growers Council, DeWitt

Michigan State Horticultural Society, Hartford

Michigan Turfgrass Foundation, Lansing

Michigan Vegetable Council, Erie

Nugent Farms, Frankfort

Summit Sales, Inc., Lawrence

Swanson Pickle Co., Inc., Ravenna

Uncle John's Cider Mill and Fruit House Winery, St. Johns

A Poetic Postscript

Between joining the faculty in 1968 and his retirement in 1996, Frank Dennis wrote numerous poems to celebrate various occasions from birthdays to retirement parties for faculty and staff members. Below is one that he wrote for his own retirement party, with verses added for persons omitted from the original.

****

Let's take a brief glance backward, as the curtain starts to fall,
Before the art'ries harden or the Reaper pays a call.
When I arrived in '68 **John Carew** was head,
He was noted for his poetry, and the kind words that he said.
The garden was outside the door with its fountain, apple trees,
And kids came there to study or just to shoot the breeze.
Lewis covered woodies with slides that were sublime,
And was a featured speaker, when he could spare the time.
Taylor taught non-majors how to care for household plants.
In order to assure a place, one applied well in advance.
Kessler taught the intro course, helped students find their route.
In '69 I joined with him to teach a course in fruit.
De Hertogh's crew was planting bulbs to figure out a way
To make them bloom when price was right – about on Easter Day.
Dunbar made corsages that you would not believe.
He knew many clever tricks but kept them up his sleeve.
Mitchell was our expert in controlling orchard beasts.
He walked upon the water, in growers' minds at least.
Larsen was our joker; he told stories by the score.
And kept fruit growers happy with the info in his store.
Hull was covering brambles, along with grapes and berries.
He later moved to Larsen's job with apples and with cherries.
The spectrograph was busy and its recommendations prized.
As **Kenworthy** smoked a good cigar, the ash was analyzed.
Rasmussen with his SEM, and **Viv Shull** at his side,
Ran samples for the guys in Hort, as well as campus-wide.
Dewey (Don) and Dilley (Dave) kept rooms filled up with fruit
As they tested gaseous mixtures – and LPS to boot.
Bukovac was working on the way to drop a cherry
How hormones penetrate the leaf --that's what was necessary.
Carrots, cucumbers, cauliflower kept Americans well-fed.
--Products known around the world that **Shig**[1] and **Larry**[2] bred.
Carolus covered veg crops and he wasn't just a-fooling
When he showed how veggies profit from evaporative cooling.
Herner, as a young recruit, already was beguiled
By ripening in tomatoes, be they RIN or NOR or Wild.
Nicklow then was working on the population race.
How many cukes could one produce on ten square rods of space ?
At the new Hort. Research Center, **Fred Richey** had control.
With **Amos**[3] and with **Archie**[4], he achieved his every goal.

Wittwer then had risen to become the Research Dean,
But still turned out the papers and gave speeches that were keen.
Stanley Johnston, breeder, was at South Haven Station.
Famous for his peaches – well-known across the nation.
Andersen traveled Michigan from Northport down to Niles.
He took the reins from Johnston, worked on fruit and ran farm trials.
For *Fragaria, Vaccinium*, **Jim Moulton** was our man
To increase size and flavor was always Moulton's plan.
Bob Carlson worked with rootstocks; he could tell 'em by their bark.
He planted seeds and chose the best – and thus he left his MARK.
Kesner was our cherry man, way up in Traverse City,
Keeping growers well-informed with all the nitty-gritty.
Let's not forget **John Gilmore**, who was boss at Graham Station.
He later moved to Clarksville, to work on irrigation.
Putnam started spraying crops with herbicidal brew,
Then changed to natural products and allelopathy, too.
Ries was studying simazine, and why it made leaves green.
The cause – nitrate reductase – soon appeared upon the scene.
Mecklenburg taught landscape hort with gusto and with fun,
Then moved on to Disney World, to show them how it's done.
Davidson knew the answers for growing nursery stock.
His book became a seller, as solid as a rock.
We all lived through Tent City, when Nixon crossed the line
And kids left many classes to wither on the vine.
Kelly came to take the helm in 1978
With plans for many changes at a not-so-distant date.
We had 500 majors – the Revolution Green.
And were graduating students like you have never seen.
Jack supervised the shifting of stations here and there,
As one was closed, another grew from ground that once was bare.
He bought us all computers; each learned to be a whiz,
To meet the competition in academe or biz.
When one's account was empty and you thought there'd been a crime
We'd count on **Ross** to keep things straight – right down to the dime.
Space got short in '86, things were getting out of hand,
So we all crossed o'er the river into the Promised Land.
Heins decided to respond to competition stiff,
He starting counting lily leaves -- and came up with his DIF.
Will Carlson was the man to watch; he sang his garden song.
Although we thought his dreams absurd, he proved that we were wrong !
Tarzan had his **Jane**[5], of course. She also heard the call
And made a children's garden that surely tops them all.
Now **Lownds** is our ambassador conveying garden lore.
His programs make kids value plants and want to learn lots more.
Spangler was well organized, with lectures and with slides.
And yet had time to supervise a slew of kids, besides.
Saylor's now our woodies man, with students by the score.
Walking tours and CDs help him cover landscape lore.

Pat Zandstra had a way with kids, they came running to her door
She hired on as advisor and brought in many more.
Husband **Bernie**'s helped our growers in response to many needs.
He's evaluated cultivars and found ways to kill the weeds.
Ewart worked with flower crops to make the better best.
And even added onions to give his work some zest.
Widders studied carpel separation to make us perfect pickles.
But now he's chair of B/C CRISP. (And beans have no such prickles.)
Loescher came in '90 to keep us all in line.
Despite these chores he garnered grants to keep plants safe from brine.
Amy's[6] traveled far and wide to find new cherry stars,
And crossed her best selections to produce new cultivars.
Shane is breeding peaches with quality that's fine;
He's given us his 'Beaumont' to extend the Haven line.
Hancock's sought out native clones of several local fruits.
Vaccinium, Fragaria have been his main pursuits.
Molecular biology is **Grumet**'s special field
If viruses attack a cuke, their fate will soon be sealed.
van Nocker's seeking answers on why fruits begin to fall.
With genetic engineering I'm sure he'll crack that wall.
A novel field has opened up – genomics is its name.
Jiang, with all her jumping genes, is a leader in this game.
Stan Howell's worked on pruning, and training for the vine,
But never has neglected the final product – wine.
Hanson's field's nutrition of fruits both large and small
Should you need advice and counsel, don't hesitate to call.
The **Langs, Suzanne** and **Gregory,** came here from way out west.
She works with turf and he with fruit, to make the better best.
Nair is seeking compounds made by economic plants
That will keep us safe from cancer and our daily lives enhance.
Photosynthesis is **Flore**'s forte, under sunlight's brilliant beams.
Plus work on irrigation – and coaching soccer teams.
Beaudry followed Dewey's lead to keep our fruits in store
Is MCP the answer –so they'll last for evermore ?
Behe's into marketing, no need for ivory towers,
She's seeking out new uses for chestnuts, carrots, flowers.
Rowe is stressing new-found ways to keep our buildings cool,
Green roofs may be the answer for fact'ry, home and school.
Phytoremediation could save our darling daughters.
Fernandez now is using it, taking nitrates from our waters.
New fields have drawn **John Biernbaum**, he's now our guru grand
On growing food organic to help to heal the land.
Mathieu [7] and **Sieglinde**[8] could make herbicides passe.
They're testing various cover crops to keep the weeds at bay.
Runkle works with orchids to determine how they bloom.
Once he finds the answer there will be a blossom boom.
Fails has been a ball of fire, she's first among the pros,
She's taught her students lots of tricks to use in flower shows.

Cameron has interests broad, from packaging to grasses.
He's popular with students, whether they be lads or lasses.
Schutzi has succeeded making gardens filled with trees.
To him we are indebted for flowers, birds and bees.
Cregg is testing fir trees, as well as fertigation.
He's planted firs around the state on every research station.
Perry thought he had it tough with training apple trees.
Now that he's Department Chair, he thinks ***that*** was a breeze.
Joyce Jackson helped us, every one, be our subject bean or berry.
She kept the books for Kelly, for Loescher and for Perry.
Call on **Lorri Busick** to see that budgets balance.
It's fortunate for Perry, as she has terrific talents.
Mulvaney's now the one to see if for labor you've a lack.
She's quiet and efficient and keeps us all on track.
Badgero, our greenhouse man, has gathered little moss.
The plants are always in their prime, and we're happy with the Boss.
McLellan teaches volunteers to bring them up to date
On being Master Gardeners – both in an out of state.
Chase has charge of operations at the Horticulture Farm
He keeps the balls all bouncing and the produce free from harm.
Nugent has been number one at Northwest's research station
His knowledge of pest management is known throughout the nation.
Zabadal is SWMRECs boss, down there in Berrien County
Where grapes and peaches, berries, cukes reflect the region's bounty.
Schwallier wears two special hats; he seldom gets to rest.
He runs the show at Clarksville and helps growers in the West.
Of all our many personnel, just one has not changed gears.
Roback's been on staff with us for 37 years.

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The watchword now – sustain, sustain, cut back on pesticides,
Keep water safe and food crops clean, to spare your pure insides.
Molecular biology may be the panacea,
For the problems of tomorrow, from disease …to diarrhea.
That brings us up to date, I guess, the details will come later,
Hort will always be supreme for this old commentator.

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[1] Shigemi Honma
[2] Larry Baker
[3] Amos Lockwood
[4] Archie Carpenter
[5] Jane Taylor
[6] Amy Iezzoni
[7] Mathieu Ngouajio
[8] Sieglinde Snapp

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