annual report 1979-80
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* Term began January 1980.
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Clemson University shares much in common with its sister institutions of higher education in South Carolina. The quality of a university, however, must be judged by what makes it stand out or what sets it apart, not by what makes it similar to other institutions.

The key to understanding what makes Clemson unique necessarily begins with Thomas Green Clemson's own explanation of why he founded it:

"My purpose is to establish an agricultural college which will afford useful information to the farmers and mechanics; therefore it should afford thorough instruction in agriculture and the natural sciences. It should combine, if practicable, physical and intellectual education, and should be a high seminary of learning.

"I desire to state plainly that I wish the Trustees to have full authority to fix the course of studies, to make rules for the government of the same, and to change them, as in their judgment, experience may prove necessary."

Clemson University is largely the fulfillment of that dream. Thomas Green Clemson was a scholar, farmer, a distinguished diplomat, an able mining engineer, the son-in-law of John C. Calhoun, a pioneer in American agricultural chemistry, and the first superintendent of agricultural affairs of the United States.

Mr. Clemson died April 6, 1888, leaving a bequest of property and money to South Carolina to establish the college referred to in his will. His dream was to create a college to benefit South Carolina farmers, but with an eye to the future needs of the State, he entrusted Clemson's Board of Trustees with the power to change the college's curricula to meet the changing needs of future generations.

Mr. Clemson believed the only hope for a better quality of life for the nation was the application of scientific education and technology to solving its problems.

History proved him right. By the turn of the century, America had emerged as the leading industrial and agricultural producer of the world and had a productive economy more powerful than any the world had ever seen. At the same time, Clemson Agricultural College was beginning to emerge as an important member of the national system of state universities and land-grant colleges which was established under the Morrill Act of 1862.
Clemson history can be broken down into two eras. From 1893 until 1955, it was a military college and still a small school. In 1964, it gained university status. This transition from military college to civilian, full-fledged university status is what has made it possible for Clemson to accomplish the mission it has today.

That mission is to maintain the State’s strong agricultural industry, to provide the back-up of technical resources required to help sustain the State’s strong economic growth and industrial development, and to ensure that all South Carolinians will have the opportunity to enjoy a better economic and social life.

Under the leadership of Ninth President Bill L. Atchley, the University is committed to a leadership role in solving energy problems; developing new food sources and better food production and delivery systems; seeking a safer, better quality environment; improving health care delivery; creating innovative educational programs; developing new industrial technology; broadening recreational and other opportunities for self-enrichment; and seeking to improve man’s other basic needs—clothing and shelter.

Today Clemson University has nine colleges and a strong graduate school. Its enrollment has grown from 446 students in 1893 to 3,033 in 1955, to 11,748 in the 1979 fall semester. It has a library with more than 900,000 volumes. Its buildings and equipment are valued at about 168 million dollars. It has 600 acres on the campus proper and 31,195 additional acres surrounding the campus and across the State for agricultural and forestry research.


But what about the uniqueness mentioned earlier? It is distinguished in several ways:

- Clemson’s curricula include programs that are simply not offered elsewhere in the State.
- Its responsibilities include directing State regulatory and consumer protection programs that in other states are handled by governmental agencies, the philosophy of the General Assembly being that certain regulations can be enforced more effectively when strong educational approaches are used.
- Its approach to people-oriented education, research and services involves innovation, economy and efficiency.
Clemson directly serves more than two million people a year in its program areas of agriculture and natural resources, community and resource development, home economics, and 4-H. Both as consultants and as researchers, Clemson faculty are deeply involved with extending the knowledge of and capability for solving very practical problems which are encountered within the business community. In the past year, continuing education courses offered both on campus and around the State by Clemson enabled more than 20,000 professional men and women to keep abreast of new methods, developments and research in their fields.

If you had to boil down the rhetoric and fancy phrases and come up with the simplest statement of what Clemson is all about, it would be the goal of improving the quality of life for all people. And fundamental to that is the sound economic development of the State. To paraphrase Thomas Green Clemson, we are striving for a better economic and social life based upon practical scientific education.

Each of Clemson’s nine colleges, their graduate programs and their continuing education and public service programs address themselves to putting that philosophy into action.
ACADEMICS 1979-1980

Graduate Studies and University Research
Arnold E. Schwartz, Dean

Undergraduate Studies
Jerome V. Reel, Acting Dean

University Extension
Samuel M. Willis, Dean

College of Agricultural Sciences
Luther P. Anderson, Dean

College of Architecture
Harlan E. McClure, Dean

College of Education
Harold F. Landrith, Dean

College of Engineering
Lyle C. Wilcox, Dean

College of Forest and Recreation Resources
Benton H. Box, Dean

College of Industrial Management and Textile Science
Wallace D. Trevillian, Dean

College of Liberal Arts
H. Morris Cox, Dean

College of Nursing
Geraldine Labecki, Dean

College of Sciences
Henry E. Vogel, Dean
The mission of the instructional programs in agriculture at Clemson University reflects the mandate of Thomas Green Clemson, "to afford thorough instruction in agriculture and the natural sciences connected therewith." Land grant institutions are service-oriented. That philosophy, coupled with the fact that Clemson is the sole institution in the State granting degrees in agriculture at the bachelor's level and higher, demands full emphasis on high quality education.

Agriculture is a dynamic field of critical importance to human-kind. Its traditional role of providing food and fiber to humans and feed for domestic animals has taken on an urgent new importance today. The world's population is growing even as space for production shrinks. And a second major role has been added in recent years—conservation and environmental protection, complicated by government restraints and regulations. Because producers must realize a profit to survive, the role of agriculture has expanded more into business and management fields. With increasing regulatory and economic constraints and decreasing labor supplies, mechanization of agriculture is an area of vital interest.

The programs in the College of Agricultural Sciences, including those in resident instruction, are integrated to serve the people of South Carolina, the South, the nation, and the world. All programs must grow and evolve, or the fundamental goals of the University and the college cannot be achieved.

To meet the mission of the College of Agricultural Sciences:

—Instruction is principles-based and oriented toward recognizing and solving problems. This could lead to a vocational emphasis, but basing instruction on principles and fundamental concepts keeps a high-level, university approach.

—Courses and curricula are constantly reviewed, evaluated and revised, with input from students and nonacademic professionals, to help ensure the best total education.

—Clemson is maturing into a recognized and respected academic institution, so expansion of graduate programs at the master's and doctoral levels is encouraged.

—Special instructional programs are developed and provided to meet the needs of all types of agriculturalists throughout the State.
A comprehensive curriculum review has been completed, and suggested changes will be evaluated and implemented as resources allow. The minor curriculum in public service or extension methods is now open to students. Concentrated efforts in developing and implementing an academic program in Integrated Pest Management continue. A proposal to offer the Ph.D. in Food Technology has been completed and is moving through appropriate administrative channels outside of the college.

First semester enrollment in agricultural sciences was slightly over 1,000; about 40 percent of the undergraduates are women, and more than 50 percent of the students came from “nonfarm” backgrounds. The more urban characteristics of the student body create a need and demand for more practical, hands-on experience and expanded lab programs. The relationship between classroom theory and field practices must be established and stressed. A newly established internship program is helping resolve this problem.

Growth in enrollment of new freshmen has leveled off, and perhaps reversed slightly. This is true nationwide. Transfer students at the sophomore, junior and senior levels tend to sustain enrollments. More advanced students recognize agriculture as a desirable academic field because of its service role and excellent career opportunities. There has been an increase each year in the number of companies, institutions and agencies seeking to hire agricultural graduates. In some areas, however, agriculture still suffers from a poor image as a career field. A grant application has been submitted to the Coastal Plains Regional Commission to produce a career awareness film to tell the story of agriculture to high school students and other groups.

The total graduate program is growing slowly as funds become available. Applications continue to exceed available support for graduate students, and demand for graduates has been good. The greatest growth has been in the professional master’s degree programs. These have been popular and effective in preparing students for many careers.

A total of 265 students graduated in agriculture this year. This includes 199 Bachelor of Science and 42 Master of Science degrees, 15 professional degrees (Master of Agriculture and Master of Nutritional Science), and nine Ph.D.’s.
Agricultural Technology Programs

The College of Agricultural Sciences continues to cooperate with the State Board for Technical and Comprehensive Education and the State Department of Education in guiding agricultural technology programs at selected technical colleges in the State. The college advises on curriculum development and shares facilities for study and/or demonstration at Clemson and at several research stations.

Currently, 12 two-year programs and a single one-year certificate program are offered at eight technical colleges throughout the State. Enrollments in these programs were 375 in 1979-80. Job opportunities and salaries for graduates have been good, and prospects remain favorable. The cooperative arrangement, which was initiated in 1966-67, has helped develop sound programs without apparent duplication and will help ensure continued success of these technological programs. The State Advisory Committee, chaired by the dean of the College of Agricultural Sciences, recently recommended approval of a Swine Science Technology Program, which is now operational. It also recommended surveying the educational/service needs for teaching in equine science. Faculty of the college are conducting this survey in cooperation with the equine industry and interested technical colleges.

Efforts to strengthen the agricultural transfer program at South Carolina State College at Orangeburg have met with limited success. However, personal contacts with faculty and prospective transfer students have been made and slow growth is anticipated.

Continuing Education

Agricultural scientists, teachers, producers and agribusiness professionals in all fields need help to keep pace with the rapid changes in agriculture. They are all interested in various types of in-service training programs, as well as conferences, workshops, seminars and professional meetings. Continuing education activities sponsored by the College of Agricultural Sciences served personnel in the Cooperative Extension Service, hortitherapy technicians, vocational agriculture teachers and veterinarians. Continuing education credit was granted for numerous programs, and more than 250 individuals received Continuing Education Units for one or more programs.

There has been continuing demand to offer regular courses in agriculture for graduate credit off-campus, particularly in the Pee Dee District. Since this type of activity must be self-supporting, other sources of support are being explored.
The success of the educational efforts of the College of Agricultural Sciences and its students can be measured in a number of ways. Career placement of graduates is excellent, and new employers continue to come on campus to interview our students. Our students serve important roles in extracurricular activities, and their scholastic accomplishments are recognized by professional organizations and by continued growth in scholarship support. The college notes with great pride that Prof. James Martin was named nationally as an outstanding teacher of dairy science; similar honors and recognition have been bestowed on other faculty.

**COLLEGE OF ARCHITECTURE**

**Responsibilities**

Professional schools have important, specific roles to perform within the environment of a university. The College of Architecture, as the only professional school in South Carolina charged with the primary responsibility of educating young people for careers in architecture, city and regional planning, building science and management, and environmental design including the landscape and product design, has a clearly understood mission. To offer these quality professional curricula, the college must also provide studies in design, history, philosophy and technology undergirding each of these areas.

A second major responsibility of the college is to be involved in such on-going research as will enable it to work steadfastly toward the improvement of the state of the art. The success of this mission cannot be merely measured in terms of dollars-volume of research and certainly not by diversity of research undertaken. Rather, it is measured in the effectiveness of mutually supportive work building toward successively more creative results in the public interest.

The third major role of this professional college is to utilize the State as a laboratory in the public service activity and develop these programs as vehicles for teaching. Since the College of Architecture is the only professional school in South Carolina responsible for the disciplines it serves, it has taken these tasks very seriously for the past 25 years. As it has moved from a small undergraduate department in 1955 to a strong, nationally significant college with 25 percent of its enrollment in the graduate school and its professional degrees occurring at graduate level, it has provided each year an ever-improving spectrum of faculty and graduate students ready to serve as teams in the undertaking of public
service projects. In 1979-80 the specific list of these studies is impressive, and the communities served are located throughout the State.

A fourth area of college responsibility is perhaps unique to the College of Architecture. It serves, and is served by, the environmental design professions of South Carolina. They are sponsors of the Clemson Architectural Foundation, established in 1955 and chartered in 1956 by the S. C. Chapter of the American Institute of Architects to provide the college with additional resources beyond those provided by the University and State for the improvement of the environmental design professions through education and research. Thus, Clemson's College of Architecture has a clear reciprocal responsibility to provide quality education and research. Despite the fact that the college's support functions are only funded 25 percent of the total designated in the Commission on Higher Education formula, its quality programs far exceed its budgeted resources. This cannot be maintained without providing authorized and justified budget allocations.

**Educational Programs**

An important area of the college educational mission lies in the rapidly growing continuing education needs of practicing professionals. Although the college has had a modest but effective continuing education history, greater emphasis has been placed on it in 1979-80 as plans were formulated for collaborating with the S. C. Board of Architectural Examiners to provide a rigorous sequence of annual short courses designed to keep our professional constituents current. Plans requiring practitioners to acquire credit annually in these courses as a requirement for continuing registration are currently being discussed. The collaboration of South Carolina design professionals and the college is further enhanced by the South Carolina Chapter of the AIA and the South Carolina Chapter of the APA, each having at least one meeting per year in the college. School faculty members and practicing professionals are involved in scores of joint committees and other collaborative programs.

The Clemson Architectural Foundation has provided funds for the past 25 years for annual programs of visiting lecturers and critics, exhibitions in the Lee Hall Gallery, student field trips, aids to the library, and above all, developing the Daniel Center for Building Research and Urban Study in Genoa, Italy, established in 1973. This facility is owned by the CAF and operated by the
College of Architecture, and each graduate student is expected to spend one semester there. By the end of 1979-80, the total number of students to have matriculated for a term in Genoa had reached 253, and 12 Clemson faculty members had served as professors-in-residence. Thirty faculty members from European universities have been guest lecturers and critics. In the late spring of 1980 a third study tour of practicing South Carolina Architects resided at the center and participated in lectures and field trips included as a part of this annual continuing educational service.

A foreign exhibit of the public service project work abroad by the Clemson architectural and planning graduate students was shown in 1980 in the ancient restored abbey of St. Mary of the Castle in Genoa. The continuing refinement of research and design activities at the Genoa center has greatly enriched and broadened the graduate offerings of the College of Architecture. In particular, the program has enabled planning and architectural students to develop a deeper grasp of the complex design problems of urban spaces involving historic preservation as well as the adaptive use of historic structures.

These studies have in turn expanded the capability of the college in effectively approaching public service and design projects in South Carolina. Goodwill for Clemson University has been enhanced abroad by creative work performed there by graduate students. It is considered to be of the finest quality of American educational programs in Europe.

This report will endeavor to illustrate efforts of the College of Architecture in 1979-80 using public service and research in advanced teaching activity. Despite general faculty understaffing, which is especially critical in some areas, the educational mission was served with maximum effectiveness.

**Public Service Projects**

The Health Care Facilities Studio continued developing research projects in mental health delivery systems on a corpus of 12 successive years of supportive studies. Also under investigation were projects for maternity care including new approaches to optimal very short-term treatment and delivery of healthy mothers, and related but separate longer term facilities for those requiring such treatment. Faculty and students in this area of graduate architectural specialty were very active in 1979-80 in programs of the American Institute of Architects—American Hospital Association. The AIA/AHA gives two scholarships annually to architectural students in
the nation. Clemson students have won this award each year for the past four years.

The College of Architecture was involved in a national design project with four other schools to study adaptation of historic campus buildings to facilitate accessibility. Clemson students confronted the problem of re-design of Fike Recreation Center. The design drawings were published in a U. S. Government Printing Office book entitled “Adapting Historic Campus Structures for Accessibility.” The drawings and model were displayed at the national AIA convention in Cincinnati, Ohio, and at the national annual meeting of the Association of Physical Plant Administrators.

Public service projects undertaken by sixth-year architectural students in 1979-80 included design of a master plan and buildings for the Rocky Bottom Camp for the Blind. The project was sponsored by the S. C. Federation of the Blind, and the resulting studies were utilized by this charitable organization for a fundraising campaign. This sixth-year group also assisted Limestone College in a minimally funded recreational facilities project for that campus. Fifth-year graduate students helped an association of retired persons in Due West program the needs for a retirement center and then developed drawings for the facility.

A small group of fifth-year graduate architectural students worked during the fall of 1979 on research and design studies for the complex of buildings now connected with the governor’s mansion in Columbia. This project, under the sponsorship of the Mansion Committee, undertook the master planning of the three historic houses and their grounds. All aspects of the design sought to be sensitive to the historic and symbolic considerations of the buildings.

Another group of fifth-year design students made studies for an energy efficient development of a new non-urban community on a 700-acre tract in Pickens County. Wind power and water powered resources were used as well as solar heating and cooling in the development which embraced housing, commercial and recreational facilities.

Department of Architectural Studies

Two professors in the Department of Architectural Studies won a first prize of $7,000 in the U. S. Department of Energy Regional Design Competition for the design of a house with passive solar cooling in Charleston. Professors Norman, Davis and Witherspoon attended the M.I.T. Energy Efficient Design sessions in Cambridge, Mass., in the summer of 1980.
The chairman of the Health Care Facilities program was advanced to fellowship in the American Institute of Architects, 1980, for his contributions to his area of education. He was also recipient of the Silver Medal of Tau Sigma Delta.

Department of Planning Studies

The Department of Planning Studies has continued to utilize public service as a vehicle for project teaching, although decline in governmental grant sources for such studies has occurred due to federal budget cutting. Accordingly, these projects have been managed under differing auspices, including chambers of commerce and other civic groups eager to improve their central business districts. A project involving community development and historic preservation and adaptive re-use of the historic area of Pendleton is under way by a team of planning and architectural students with an architectural historian consultant.

The Planning Studies Department has a small research grant from the NOAA for “A Land-Use Fiscal Impact Model.” The department has filed proposals for several major grants which appear promising for the next fiscal year and are consistent with current teaching-research-public service objectives.

The summer internship required between the first and second graduate years in the planning degree program has proved very effective and has made MCRP graduates particularly competitive after completing their programs.

During the past year a professor of planning studies completed a demographic study of Lagos, Nigeria, for the U. N. and attended the M.I.T. conference on the “Role of Policy Analysis in the Education of Planners,” as well as the H.U.D. conference on “Municipal Fiscal Squeeze.”

The acting head of the Department of Planning Studies became editor of the “Palmetto Planner,” a publication of the S. C. Chapter of American Planning Association, and was admitted to membership in Pi Alpha Alpha, an honorary fraternity in public administration.

Another planning studies professor presented a paper, “The Upper S. C. Textile Heritage—A Case for Preservation,” at a Greenville conference on “Social Physical Impacts of the Textile Industry in the Piedmont.” He was co-investigator of a Coastal Energy Impact Program grant and developed a land-use fiscal impact model for energy related growth of the S. C. coast.
A short course on planning for S. C. local government officials was also conducted by the Planning Studies Department as was a workshop on “National Agricultural Land Studies” in Burlington, N. C.

In 1979, a Clemson student was elected president of the National Student Association of the American Planning Association. This same student won a national presidential internship to work with the Environmental Protection Agency in Washington, D. C.

As part-time positions, graduate students in the Planning Department are serving as director of planning and director of community development for the City of Clemson, and director of community development for Anderson County.

Department of Building Science and Management

The Department of Building Science and Management has been heavily involved in teaching activity due to understaffing, but individual and collective accomplishments in innovative teaching, interdepartmental college coordination, and professional development and public service were notable. Energy research related to solar heating and cooling and energy conservation work in the design studios of the college have been buttressed by the technical collaboration of several members of the building science faculty. Three members of the faculty also participated in the Solar Energy Conference sponsored by the Governor’s Office and the S. C. Brick Masonry Association.

The head of the Department of Building Science and Management conducted a professional development seminar titled “Contract and Construction Law.” He also spoke to the Construction Specifications Institute in Greenville on “The Need for Recertification of Architects and Constructors.” Another colleague chaired the section on architectural acoustics at the 98th Meeting of the Acoustical Society of America in Salt Lake City, Utah.

Of particular note was the very effective collaboration between the building science faculty and the design faculty in the development and refinement of the MATRIX, the fundamental two years of coordinated design and building science courses required of all students in college programs.

Department of History and Visual Studies

Public service activities are an inherent part of the disciplines embraced by the Department of History and Visual Studies, although these take a different form than most such work in the
College of Architecture. Visual studies faculty members are heavily involved in individual creative research which relates directly to a growing public concern for the arts and their role in the enrichment of the human environment. Their work requires an empathic relation with the public (the consumer and the audience). One of the visiting speakers in 1979 was Donald W. Thalacker, who spoke from the point of view of an administrator of programs of the federal government in his view of "The Need for Art in Architecture and Planning."

All members of the studio faculty in visual studies participate vigorously in public exhibitions and gallery and museum shows. Professor of creative photography Sam Wang is greatly sought as an exhibitor in national offerings. Professor Michael Vatalaro is currently in a circulating state exhibit titled "Seven Young Artists in South Carolina."

On the local level the Lee Hall Gallery in the College of Architecture provides an important campus cultural offering as well as an important resource to the College of Architecture. Shows have included work of most members of the visual studies faculty, and exhibits are initiated by the Gallery and circulated to other galleries in the State and nation. The department works closely with other departments of the college, and graduate work of M.F.A. students is conducted in Genoa as well as Clemson.

The history studies faculty have been very active in research and in public service related to historic preservation. The resident chairman of the Daniel Center for Building Research and Urban Studies is president of the Ligurian Section of Italia Nostia (Italian National Trust for Historic Preservation) and is an architect and architectural historian of note. His book on Genovese villas and palaces is well known, and he is a cornerstone in college efforts in architectural history research overseas and in historic preservation in architecture and planning.

Another history studies professor has completed research in 1979 on urban planning improvements in Rome during the reign of Pope Pius, IV.

During 1979-80 the College of Architecture has been constantly engaged in evaluation of program requests for subsequent study. Each of these is assessed for educational value as well as the importance of the project as a public service venture and as a research contribution. Those projects selected are given priorities and scheduled. Improvement of the State's physical environment by the departments of the college is vigorously sought.
COLLEGE OF EDUCATION

The academic year 1979-1980 was a year of re-evaluation and analysis for the College of Education. Committees were appointed to review curricula and to recommend changes which will enable the Clemson graduate to meet the challenges of this decade. The College of Education studied ways to make its teaching, public service and research programs and systems of delivery more effective. The college was visited by a NASDTEC committee (National Association of State Directors of Teacher Education and Certification) which recommended approval of all programs.

Tillman Hall architectural plans were completed and renovation was begun. While retaining the historic exterior, the interior has been redesigned to house a laboratory-oriented College of Education.

Teaching and Instruction

The College of Education graduate continues to be in great demand. Increasing numbers of recruiters came from out of state to interview graduates.

The Doctor of Education Degree in Vocational and Technical Education was approved by the Commission on Higher Education and will be implemented in the fall of 1981. Conferences with public school and two-year college administrators provided valuable input on the current needs of these areas.

In-Service

The college provided both credit and non-credit in-service and staff development programs to teachers and other professional educators. The college taught 120 off-campus courses for university credit at 42 different locations in the State and enrolled more than 2,360 teachers who were upgrading their professional skills. The following institutions—Columbia, Erskine, Newberry, Presbyterian and Wofford—taught 13 courses to 78 teachers who were awarded Clemson University graduate credit under a cooperative arrangement.

In addition to credit courses, workshops were conducted in various sections of the State for vocational educators. More than 900 educators upgraded their skills in such areas as welding, horticulture, small engines, and managing changes in vocational education. The Department of Agricultural Education continued to assist local schools and area vocational centers to organize advisory committees. New advisory committees were established in 10 schools.
Research and Contracts

During the fiscal year the College of Education had $1,270,088 in grants and contracts in effect. These grants and contracts provided such services as training programs, diagnostic services, training materials and research.

The graphic communications curriculum project continued to provide new and updated materials for use in graphic arts instructional programs throughout the nation. The Printing Industries of the Carolinas (PICA) Foundation supported the curriculum project with a $30,000 grant and a $10,000 contribution to the Edgar H. Snider Scholarship Fund. The curriculum project has developed a comprehensive series of learning activity packets (LAPS) and self-instructional packets (SIPS) which are designed to be used with all levels of learning from the junior high schools through graduate programs. Requests were made by several foreign countries to have the materials translated into Spanish.

The Vocational Education Media Center continued the Prevocational Kit Development and Loan Program. During this year the prevocational teachers in the Appalachian Region used 146 kits. In addition, 30 kits were used in special programs outside the regular prevocational programs.

The Media Center cooperated with three other states in the development of performance-based curricula and instructional materials for use in home economics programs. These materials will be field tested in 80 programs during the next school year. In addition, performance-based instructional materials were prepared for field testing in five other vocational curricula.

The Department of Agricultural Education assisted agriculture departments in program evaluation through a Standardized Achievement Testing program designed to measure the cognitive domain of students enrolled in off-farm occupations courses. This service provided standardized pre-tests and post-tests for agricultural mechanics, ornamental horticulture, pulpwood harvesting and turf and lawn management. New and revised standardized tests were also developed in environmental sciences and natural resources occupations, forestry, sales and services, and other areas as the need arose.

During 1979-80 the revised horticulture test for first-year students and the new horticulture test for second-year students were administered to collect data for performing item analyses and developing new norms.
Normally, these tests are administered as pre- and post-tests by the vocational agriculture teachers and the answer sheets are returned to Clemson for scoring and interpretation. Each teacher is able to obtain feedback on how much progress students make from fall to spring, and is able to compare the performance of the students and the school with others throughout the State by percentile ranks. Over 1,300 students were tested this year.

**Special Activities and Services**

A New and Returning Teachers Conference was conducted jointly by the Agricultural Education Department and the State Department of Education at midyear in Columbia. Participants explored problems and possible solutions and projected plans for the remainder of the 1979-80 academic year. Emphasis was placed upon making instruction vocational, competency and career-oriented, with special reference toward preparing students for off-farm agricultural occupations.

The Department of Elementary and Secondary Education hosted the Clemson Reading Conference, Clemson’s Innovation Day at Piedmont Technical College, an evaluation workshop with Anderson District 5 plus many other smaller meetings and workshops. More than 2,500 public school personnel participated in these activities.

The Military Science Department participated in numerous rifle matches and represented Clemson University in national drill events at Fort Campbell, Ky., and Fort Jackson, S. C.

The departments of Aerospace Studies and Military Science sponsored the eighth annual Tiger Drill Meet in March 1980. The event provided the opportunity for junior ROTC drill teams of all services from high schools throughout South Carolina to compete for recognition. The meet also provides recognition for Clemson University among high school students and at the national level. For example, a brief story and photo concerning the Air Force meet winner was published in the monthly “Air Force Magazine.”

Air Force ROTC cadets visited three Air Force bases in the academic year 1979-80: Myrtle Beach AFB, S. C.; Robins AFB, Ga., and Patrick AFB, Fla. Two of the trips were made on USAF aircraft, giving the cadets an opportunity to become familiar with flying procedures. At Patrick AFB the cadets visited the Cape Kennedy Air Force Missile Test Center, watched an actual space satellite launch, and got a first-hand look at the Space Shuttle launch facilities, the Air Force Space Museum and the Kennedy Space Information Center.
This year a coed became the first at Clemson to obtain a pilot slot. She will also be the first woman cadet to command the cadet group.

The Department of Industrial Education hosted the Southeastern Trade and Industrial Education Conference in May 1980. The membership of the conference included the State supervisory staff and the teacher education personnel for trade and industrial education from 11 southeastern states, Puerto Rico and the Virgin Islands.

Members of the College of Education faculty served on a number of policy and decision-making task forces affecting education on the State and national levels. These task forces worked on issues dealing with educational leadership, programs for the handicapped, certification standards and improving SAT scores.

**COLLEGE OF ENGINEERING**

The College of Engineering provides leadership for the State in those areas of technology that affect people’s daily lives—areas such as energy, industrial development, transportation and environmental protection.

The college strives to meet this challenge by working:

- To supply the trained engineering manpower needed for technological progress and economic development in South Carolina and the nation.
- To conduct research that expands engineering knowledge, education and practice.
- To serve the public by taking engineering education and expertise beyond the campus to the practicing professional in government and industry.

The essence of the college is its faculty. Its operating programs constitute a professional college.

**Instruction**

Two new academic degree programs were added in 1980—the B.S. and M.S. degree programs in computer engineering. The college now offers nine undergraduate, 11 master’s, and nine doctoral level degree programs. Six basic and four advanced level engineering programs plus the engineering technology program are accredited by the Accreditation Board for Engineering and Technology (this was previously the Engineers Council for Professional Development).

More than 280 engineering undergraduates represent about 85 percent of all students participating in Clemson’s Cooperative Edu-
cation program, which allows students to alternate during their sophomore and junior years between school and full-time work in industry, business and agencies. This program provides a unique and valuable learning experience for each student involved. In addition, the mutually beneficial contact with approximately 200 southeastern organizations brings the College of Engineering closer to engineering in industry.

The demand for engineers, particularly at the baccalaureate level, continues to grow. This has created strong competition among companies for graduates and has pushed salaries to record highs. The average 1980 Clemson engineering graduate had more than three job offers and began his career earning more than $20,000 per year. Demand for women and minority engineers continues to be extremely strong. To meet these challenges, the college has set a goal of increasing minority enrollment by five percent a year through the 1980s.

There were 2,453 students enrolled in fall semester 1979, of which 191 were in master's level programs in engineering and 42 were pursuing doctoral degrees. More than 35 students have taken advantage of the college's off-campus Master of Engineering degree programs for the fall 1979, allowing them to pursue a professional graduate degree while holding a full-time job. Five students completed requirements for master's degrees in electrical engineering and mechanical engineering through the externally delivered mechanism during the year.

Master of Engineering program course work was offered in Charleston for the first time during the 1979-80 spring semester using facilities loaned by The Citadel.

The college has a principal near-term goal to strengthen its graduate programs and accompanying research, with the intent of expanding the enrollment of 300-plus graduate students by 1984-85.

The relatively new Engineering Technology Department continued to grow in the 1979-80 school year. Total enrollment was 263 students (all undergraduates). A record high of 55 B.S. degrees were awarded in engineering technology over the year. The first head of the Engineering Technology Department was also recruited and selected.
Research

College of Engineering research expenditures for 1979-80 exceeded $1.87 million on 83 active projects sponsored by federal, State and industrial grants and contracts. Total research grants-in-force, including multi-year contracts, exceed the $5.3 million mark. Grants and contracts awarded to college faculty in 1979-80 exceeded $2.6 million, a record high for a single year. Eighty faculty were actively engaged in research during 1979-80. Their efforts were supported by more than 100 graduate and 40 undergraduate students.

Engineering research at Clemson has three essential objectives: (1) to seek new knowledge, (2) to seek answers to both short-term and long-term technical problems of the State and nation, and (3) to support advanced-level educational programs by providing basic and applied research projects for graduate and undergraduate students to gain engineering experience under the supervision of experienced engineering researchers.

More than $1.8 million in energy research projects make up the largest single area of research interest in the College of Engineering. Clemson engineers are helping the State and the nation move closer to energy independence by seeking cost-effective energy alternatives and applying sound engineering design principles to energy conservation.

A partial list of projects active during 1979-80 gives an indication of the breadth and scope of research in engineering at Clemson.

A major study is under way at Clemson with $71,640 in support from the Public Health Service to improve the techniques for intramedullary implant fixation. Bioengineers are seeking to determine the extent to which electrical potentials can influence osteogenic activity in the porous implant materials.

Ceramic engineers have developed special coatings for brick that enhance their effectiveness as solar energy collectors. A series of test rooms is now being constructed to obtain design information on the Clemson coatings and other aspects of passive solar design. This $50,000 project is being funded by the Department of Energy and the Brick Institute of America.

Improved methods for the disposal of baghouse dust and development of commercial uses for this material are the goals of a $32,000 project being funded by Georgetown Steel Corp. Ceramic engineers are teamed with environmental systems engineers to conduct this study.
A study to optimize energy usage in textile finishing operations is currently being made by chemical engineers in a $115,000 project supported by the Department of Energy. A hypothetical dyehouse will be mathematically modeled, and after testing under actual mill operating conditions, a computer program will be developed for optimal scheduling of the dyeing operation.

A one-million-pound capacity masonry testing machine, donated to the Department of Civil Engineering by the Brick Institute of America, was installed. The giant machine will test structures and building materials and helps establish a unique test facility.

An NSF research grant of $103,000 is enabling civil engineers at Clemson to measure lake evaporation rates by use of newly developed vapor budget techniques, and a $130,000 NSF research grant has helped them develop improved masonry anchoring devices by investigating their cyclic response.

Clemson's civil engineers have also helped the State implement a computerized program to analyze highway accidents and to evaluate countermeasures to improve safety.

Solar cells are being tested for reliability in a $300,000 project with Jet Propulsion Laboratories. This study by electrical engineers is the first and only study of its kind.

Environmental systems engineers have developed a new program to study the effects of toxic chemicals in the environment, and to study methods of removing such materials from wastewater discharge. Funds in the amount of $577,000, derived from various sources, currently support this new research area. A nuclear environmental engineer has been added to the faculty to develop a program of study in nuclear waste disposal techniques.

Funds from NASA are supporting mechanical engineers in the study of fracture and crack growth in composite materials.

The Department of Transportation and the Federal Railroad Administration have funded a $462,000 research program by mechanical engineers to study rail freight car dynamics.

Mechanical engineers are designing and developing machines to automate various industrial processes. The Alcoa Foundation and the Caterpillar Tractor have funded a $90,000 effort, and other companies are considering funding for additional projects in this area.

Duke Power has funded a $230,000 feasibility study by mechanical engineers for a new cable tray hanger design for nuclear power plants to withstand seismic loads.
Mechanical engineers are conducting a $50,000 feasibility study for the Department of Energy of residential and commercial district heating using existing water supply systems to deliver geothermally heated water.

Systems engineers are seeking to develop a unified data base of human resource information which can be used during weapon systems design to achieve lower operational costs. This $606,500 project is being funded by the United States Air Force.

Engineering technologists completed development of an in-service training program for hospital cost containment. This effort was sponsored by the Department of Health and Human Services and the S. C. Commission on Higher Education.

Several college faculty received special recognition during 1979-80 for their accomplishments. Bioengineer Joon B. Park won the fourth annual McQueen Quattlebaum Faculty Achievement Award for research contributions in the areas of dental materials and orthopedic applications of bioelectricity. Environmental systems engineers T. M. Keinath and L. G. Rich traveled to the People's Republic of China at the invitation of the Chinese government for information and technology exchange.

Public Service

Another major area of public service by faculty members is the college's Continuing Engineering Education (CEE) program. Technology transfer to practicing engineers and, through them, to their business or government employers has had an immediate and beneficial impact on the economy of the State. During the past year engineering faculty served more than 10,022 people through CEE courses, seminars, workshops and symposia which represented a total commitment of 649 program-days, making the Clemson program the largest in the State and one of the strongest in the nation.

Major programs included: a two-day conference and exhibition on “Energy Conservation through Residential Design” which was attended by more than 600 people; a Plant Operators Forum for brick manufacturers with more than 300 participants; and the First Annual Conference and Exhibit on “Energy in the 80’s” which had an attendance of almost 500.

Another major CEE program is the presentation of intensive three-week courses on microcomputers especially for employees of Western Electric Corp. Fifteen of these courses will have been presented by the end of 1980. Western Electric's support through
this program has helped develop outstanding microcomputer laboratory facilities at Clemson.

The second Clemson Conference and Exhibit on Small Computers was attended by more than 400 people. The conference featured six technical sessions concerning small computer applications in a variety of fields including engineering, agriculture, education and business. More than 25 exhibitors filled the main floor of the Clemson House with the latest in small computer systems, hardware and software.

An invited short course on rail vehicle dynamics was presented at the U. S. Department of Transportation test center in Pueblo, Colo., and also at the Carl Cranz Gesellschaft in West Germany. Another invited seminar on design of cryogenic cooling systems was presented at NASA, Ames Research Center.

Still other short courses and workshops that are representative of the many CEE programs conducted are: Boiler efficiency workshops for industry; SI metric workshops for secondary school teachers; and short courses on soil and site improvement, and computer graphics. In March the college hosted the 10th annual S. C. Highway Conference.

The third year of the summer engineering program for minority high school students continued that program’s record of success. Of the 60 who inaugurated the program in 1978, 52 will enroll in college in the fall and at least 39 plan to study engineering. Clemson’s freshman minority engineering enrollment for fall 1980 is expected to double that of the previous year.

For the second year, an Appalachian Council of Governments-sponsored summer workshop in engineering for women is also scheduled. This is a two-week program open to all South Carolina Appalachian Region female students who are rising juniors in high school. Twenty-five students, chosen from 117 applicants, will stay on campus and experience a mini-version of college life. Classes will be held in computer programming, communications skills and laboratory work.
COLLEGE OF FOREST
AND RECREATION RESOURCES

The teaching, research and Extension programs of the College of Forest and Recreation Resources are strongly oriented toward the historic mission of Clemson University as a land-grant institution. Both departments fall within this mission of serving the needs of the population at large. The mission can then be simply stated as the gathering and dissemination of knowledge pertaining to all fields of forestry and recreation through a dynamic undergraduate and graduate education program, an imaginative and creative research program, and service programs that are carried on in cooperation with the public.

Department of Forestry

As the only university in South Carolina with a forestry department, we have the unique opportunity to supply the foresters who manage the 12.5 million acres of forest land in this state. In fact, over 50 percent of our graduates to date have stayed in South Carolina to meet this objective. Our curricula at Clemson emphasize the role of wood as a basic forestry resource. They provide for study in the area of Wood Utilization or in Forest Management. Our primary academic goal is that of graduating well-educated, highly motivated, confident professionals who are capable of coping with the problems of the future. Our undergraduate studies are augmented by both a Master of Science and a Master of Forestry program for students who want to prepare themselves for special assignments in forestry.

Teaching

During the academic year 1979-80, 24 candidates received the Bachelor of Science degree; 20 graduated from the Forest Management program and four from the Wood Utilization program. Seven degrees were awarded at the graduate level with two candidates receiving the Master of Forestry degree and five receiving the Master of Science. A total of five new faculty members were added to the Department of Forestry. Their expertise will make a fine addition to the department.

The Wood Utilization curriculum was revised during the year. Included in this was the addition of a required summer camp program as well as five new undergraduate and graduate courses. These courses will be offered for the first time during the 1980-81 academic year.
Another innovation developed by the faculty members was the first annual forestry weekend for prospective forestry students. This effort will help locate prospective forestry students and get them to the campus to see the facilities and hear about the programs that are available to prepare them for a career in forestry.

The long-awaited, proposed Ph.D. program for forestry was completed during the year. It was reviewed by the College Curriculum Committee and forwarded to the Graduate Council of the University for action. It is expected that this program will be implemented in August 1981.

The summer camps for Clemson University forestry students and the University of Tennessee forestry students were jointly conducted at Clemson for one week during 1980. This effort was highly successful and afforded students from both schools an opportunity to accomplish mutual objectives. This approach was the first of its kind to combine two summer camp programs with joint instruction at one place. It is hoped that the effort will be continued next year.

Research

The research programs in the Department of Forestry are carried out through the coordinated activity of four teams, each of which directs its efforts toward solving problems in a specific area. The purpose of the research teams is to provide the people of the State of South Carolina with the best possible information on how to manage and utilize their forests and forest products to meet present and future demands, yet maintain a wholesome environment for living.

The Timber Production Research Team is composed of scientists in forest soils, silviculture, entomology, genetics, pathology and tree physiology. Its mission is to conduct a research program that will help solve the problems preventing full timber productivity in South Carolina's forests.

The team completed projects and published research results in the areas of forest protection, regeneration, tree culture, site improvement and more.

These research results will aid forest landowners and managers of South Carolina to increase productivity of wood and fiber from our forests.

In addition to the ongoing State research program, successful funding was obtained for a variety of new studies from agencies outside South Carolina. A $50,000 grant was obtained from the Appalachian Regional Commission to determine the availability of
Forest biomass for industrial power production in Appalachian South Carolina.

Oak Ridge National Laboratory granted a $35,000 extension to determine the ecological impacts of whole tree harvesting on forested watersheds in the S. C. Piedmont. A $50,000 grant from USDA will be used to develop and validate pine beetle hazard rating methods to predict when and where the destructive insect attacks will occur and how they might best be controlled.

The Georgia Forestry Commission has given $12,000 to investigate the potential benefits of mechanical shearing versus chainsaw harvesting for controlling hardwood sprout competition when replanting pine trees. A $10,000 grant from the Georgia Forestry Commission will be used to study the effects of prescribed fire on seedling and sprout development in upland oak stands.

These new research projects are excellent additions to the continuing effort to help South Carolina landowners manage their forest resources for greater productivity.

The Forest Management Research Team is a problem-oriented, multi-disciplinary team composed of eight scientists. Its mission is to enhance the quality of life and economic strength of South Carolina by determining solutions to forest-based, multiple-use problems through a program of team-oriented research. The team has contributed to this mission by accomplishing the following:

—Implementation of the Management Alternatives Research Project (MARP). The project will provide forest managers with an assessment of management techniques as they are applied to forest lands managed for wood production, multiple-use or protection.

—Completion of a problem analysis in the area of forest influences. The problem analysis allows scientists and administrators to readily identify areas in critical need of research.

—Conducting a study of the conservation research portion of the Soil Bank Program which found that 83 percent of the lands originally planted in trees were still forested. This verified the success of the program.

—Determining the composition and structure of old growth forest stands on the Savannah River Plant site. This will greatly help in managing these stands.

—Completion of work on aspects of three endangered plant species. This information will help in their protection and management.
The distribution of oglethorpe oak (*Quercus oglethorpensis*) in South Carolina was determined; the composition of a gooseberry (*Ribes echinellum*) community was delineated; and the abundance of Black-Eyed Susan (*Rudbeckia hebiopsidi*) was determined.

The Wood Utilization Research Team revised its research plan and hired its first full-time technician. Four new research projects involving wood quality of hardwoods and weight-volume interrelationships of whole-tree biomass were initiated during 1979-80.

The faculty of the Belle W. Baruch Forest Science Institute of Clemson University published 10 articles, and one member co-edited the proceedings of a symposium on Multiple-Use Management of Forest Resources.

The Institute hosted a Regional Lowland and Wetland Research Workshop at Hobcaw and co-hosted the Multiple-Use Symposium at Clemson University. Faculty members and graduate students presented papers at conferences at Hot Springs, Ark.; San Francisco, Calif.; Syracuse, N. Y.; and Gainesville, Fla., concerning research on American Woodcock habitats, feral ungulates' impacts on a barrier island, nitrate leaching in a Minnesota forest, and implications of ground water response to the practice of forestry in the Coastal Plains.

The faculty maintained 22 active research projects in the Coastal Plains and initiated new projects concerning ground water effects on loblolly pine growth, mineral cycling in a loblolly pine stand, review of literature on fox squirrel habitat, and salt spray effects on maritime vegetation. The U. S. Forest Service, Southeastern Forest Experiment Station at Asheville, N. C., continued support of research on the Red-Cockaded Woodpecker and funded the fox squirrel project. The National Park Service extended funding for two years on the study of feral ungulates on Shackleford Island, N. C.

The Institute hosted several technical conferences dealing with regional and national planning sessions and provided a field trip for the American Forestry Association's national meeting which was held at Charleston.

The staff continued to participate in a local lecture series on coastal ecology and provided input into coastal ecology classes for school children in kindergarten through high school. Approximately 2,000 visitors were given tours at Hobcaw to explain the value of the research and educational programs and to create a better understanding of how forests are managed to provide a variety of uses to mankind.
Extension

To complement the teaching and research in the Department of Forestry, our Extension Forestry Education Program has the responsibility to provide the State's citizens with the information they need to make decisions concerning the management and use of forests and forest resources.

During the past year Extension Forestry has produced six major publications. Four of these were new efforts, while two were revisions of materials which had been developed in the past. Topics included forestry as an investment, the role of fire in forest management, marketing timber, and chemicals for use in forest operations. In addition to the marketing publications two other publications were developed concerning the forest industries in South Carolina and persons who buy timber in various counties. These efforts are designed for use by county Extension agents and other personnel in advising landowners on opportunities available in selling timber.

At present the forest industry in South Carolina is expanding. As it expands, additional raw material will be needed. Since timber sales are infrequent occurrences for most landowners, Extension Forestry will be doing additional work in the marketing field to prepare landowners to maximize their opportunity when selling timber. One of the services available is timber price information which can be obtained by any landowner from county Extension offices.

During the past year four workshops were held in conjunction with the Forestry and Harvesting Training Center of Long Beach, Miss. These programs are being well received by the forest industries within our area. In addition to these workshops, other seminars and workshops have been held for landowners and professionals on a variety of topics.

Extension Forestry had a special opportunity last year to cooperate with the American Forestry Association in developing and participating in their annual meeting in Charleston. Extension Forestry was responsible for one and a half days of the program conducted at this meeting. Over 400 people heard and discussed forestry subjects relating to private landowners.

Department of Recreation and Park Administration

One of the most significant happenings during the 1979-80 academic year culminated with the award of outstanding recognition and accreditation to the department's undergraduate program by the NRPA Council on Accreditation. This has been another excep-
tional year for faculty participation in professional associations and societies with some 30 persons serving in positions of responsibility in State, regional and national organizations.

Teaching

The improvement of teaching has been a high-priority item for the faculty during the past year. Course outlines have been revised, and special emphasis has been placed on sequential development of the competencies needed to manage leisure service systems. This has been accomplished as the result of consultation with alumni and strong working relationships with practitioners in the field. A further strengthening of the teaching area was brought about by student research projects under the direction of faculty and specifically applied to problems encountered in the leisure service field. Examples of these projects are: relationships between campers and their vehicles as used in 28 South Carolina state parks; a study of transportation accessibility to the handicapped of upper South Carolina; a comparison of leisure resources and the incidence rates of alcoholism in three counties in South Carolina; and the anxiety level of pediatric patients at Greenville General Hospital based on participation in the orientation program.

Research

Research development continues to be a major focus of activity for the faculty members in our department. Seven research contracts funded by the U. S. Forest Service were in effect during the year. These included: analysis of U. S. Forest Service inventory data; recreation uses of private lands in urban areas; impacts of recreation on stream resources; demand modeling for forest-based recreation; application of multi-resource inventory data to recreation planning; coordination of private sector recreation data collection; and a study of need for recreation resource management technology transfer in the Southeast.

Subsequent years will see continued efforts to expand the number of sources from which external funding is secured. Other research investigations under way in the department included: study of Recreation Commission and board members in South Carolina; methods of evaluating recreational potential on dispersed land tracts; development of rationale for natural area inventories in South Carolina; church involvement in recreation in South Carolina; recreation use of S. C. domestic water supplies; analysis of
federal employment of recreation personnel; evaluation of facilities developed with land and water conservation funds.

In addition, the faculty was called upon to make some 20 presentations at professional meetings, seminars and workshops throughout the State, the Southeast and the nation.

Extension/Continuing Education

Two workshops were held during the year. For the second year, the department provided an executive development program for the U. S. Army Corps of Engineers. We began a course for the U. S. Forest Service on recreation resource management.

Other examples of continuing education activities included: third annual summer school for gerontology; national trends in recreation Symposium; college week for senior citizens; and city of Greenville staff development workshops.

Visitations to many agencies were included in our Extension program. For example, visits were made to Bryan Psychiatric Center, HCRS and USFS in Atlanta, city of Orangeburg, city of Greenville, S. C. Department of Parks, Recreation and Tourism in Columbia, and Charleston County Parks, Recreation and Tourism in Charleston.

Extension/Camping

The Outdoor Laboratory continues to expand, and the offices of the director and his staff have now been located on-site to facilitate laboratory operations. This year 38 directors of day and residential camping programs in five states came to Clemson to interview students for summer employment. Students from our department organized and directed certain facets of this service.

Camping programs were held for many groups such as children with speech and hearing difficulties, senior citizens, visually handicapped children, emotionally disturbed children, youngsters with hemophilia, and mentally retarded children and adults. A camp for diabetic children was added to our list of special programs this year.

In addition to the programs listed, the Outdoor Laboratory is available for year-round use by any group or organization. Typical use included such groups as the Boy Scouts of America, Fort Hill Presbyterian Church, 6th grade classes at Morrison Elementary School, and the Environmental Systems Engineering Short School. A total of 4,800 persons in 95 groups took advantage of the facilities of the Outdoor Laboratory.
Extension/Planning

Planning activities, coordinated by the department's faculty, included: master plan evaluation for Camp WaBak, Ninety-Six Council of Girl Scouts of America; city park planning for Walhalla; conceptual plan development for Rivermont Ranch, Cleveland, N. C.; visitor services effectiveness evaluation for Cowpens National Battlefield; interpretive program planning and development for the U. S. Army Corps of Engineers; design plan for Camp Burnt Gin, Department of Health and Environmental Control; design plan for Elliott Springs Hospital, Lancaster; and preliminary review of spatial patterns of federal and State land ownership in South Carolina.

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

Completing its 17th year, the College of Industrial Management and Textile Science was in the throes of renovation during the year. To facilitate a $4.5 million update of Sirrine Hall which houses the college, it was necessary to consolidate all activity into half of the building for the entire year. To accommodate this, much of the teaching activity was moved to other campus buildings. At the close of the year, the completed half of the building was occupied and the remaining half released to the contractor for renovation. At the end of this two-year ordeal the college will be operating in a totally renewed structure, which will add greatly to its efficiency.

Growth in demand for curricula offered by the college continues, necessitating a faculty of 96 and a staff of 36. Its 14 degree programs continue to attract about one-fifth of the students enrolled at Clemson, and a major portion of the student body is served through basic courses in economics, management and accounting. In addition, the public is served through the college's continuing education programs and extensive research effort. A closer look at its four departments and the Office of Professional Development follows.

Department of Accounting and Finance

Student demand continued to increase for enrollment in programs and courses offered by the Department of Accounting and Finance. Accounting majors increased by 19 percent to 327, while financial management majors increased by 32 percent to 502. The
majors in both programs increased by 27 percent to 829. Student enrollment in courses in accounting and finance increased from more than 2,000 per semester in 1978-79 to more than 2,300 per semester in 1979-80 with more than 2,500 having requested enrollment for fall semester 1980. Approximately 1,100 students, or more than 10 percent of the entire undergraduate student body, pre-registered for the basic accounting courses for the 1980 fall term. A majority of these students will continue in higher level courses in accounting and finance, with the majors in accounting or financial management taking 12 or more courses in their major areas. During 1979-80 faculty positions authorized continued at the 1978-79 level of 21 positions. The faculty included 10 doctorates and five in the all-but-dissertation status. Thirteen faculty members were certified public accountants, six were certified management accountants, and one was a certified data processor. Employment opportunities for our graduates in accounting and finance continued to be favorable. Seven of the "Big Eight" certified public accounting firms recruited our students on campus during 1979, as did an increasing number of other State and local CPA firms. Positions in business, industry and government were available to both accounting and financial management graduates. The two degree programs continued to provide excellent preparation for entry into law or graduate studies. The curriculum for the Bachelor of Science degree in accounting was revised effective with the 1980 fall term to serve both as a strong baccalaureate degree program and as an integrated part of a professional program which is intended to lead to the Master of Professional Accountancy degree. During 1979-80 the department continued its work toward proposing a professional program in accountancy which would comply with the standards for accreditation adopted by the American Assembly of Collegiate Schools of Business at its annual meeting in June 1980.

Department of Industrial Management
Traditionally the Department of Industrial Management has emphasized maintaining quality programs and providing excellence in teaching. During the last year this emphasis resulted in newly revised curricula for both the administrative management and industrial management programs and the recruitment of new faculty members. Although excellence in teaching is the main priority, research, consulting and public service also continue to
be very important goals with the faculty who have published and/or presented 60 papers and provided aid to numerous firms during the year.

Number of majors by categories:

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
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<tr>
<td>Graduate Resident</td>
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</tr>
<tr>
<td>Clemson/Furman MBA</td>
<td>190</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
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Degrees awarded by type:

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<th>Degree</th>
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</thead>
<tbody>
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</tr>
<tr>
<td>Master of Science</td>
<td>13</td>
</tr>
<tr>
<td>Master of Business Administration</td>
<td>27</td>
</tr>
<tr>
<td>Doctor of Philosophy</td>
<td>6</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>291</strong></td>
</tr>
</tbody>
</table>

Our graduates continue to be highly recruited for employment by both regional and national firms. A large number find employment in the production and marketing areas for which our curricula prepare them well. However, graduates are by no means limited to these areas since they are also prepared to work in such areas as personnel, labor relations and finance. The nature of the industries who recruit our graduates is diverse; however, positions in the textile industry for graduates of the Industrial Management Department appear to be abundant.

**Small Business Development Center**

During the fiscal year the Small Business Development Center conducted 23 continuing education courses which addressed the basic needs of small businesses. More than 135 clients utilized the consulting services offered by the center. These services included market research, business start-ups, initiating record-keeping processes, and general management advice. Research in the small business area involved undergraduate and graduate students.

**Department of Economics**

The 1979-80 academic year brought the Department of Economics national acclaim from faculty members’ accomplishments, new levels of growth and development in scholarly research, a record number of students taught, and an all time high number
of majors. This year's departmental milestones in quality instruction, academic research, and public service also signify promise for the future.

Enrollment in economics courses once again increased by more than 10 percent and now exceeds 2,400 per semester. Even with evening overload courses held for the first time in the department's history, we were still unable to meet the student demand for economics courses.

Since forecasts for the future are for continued growth, the department looks forward to expanding the number of upper division options available to undergraduate majors. The expansion began this year by offering a new course in mathematical economics and reactivating the comparative economics systems course. Amendments were made to both the graduate and undergraduate curricula that upgrade all degree programs and, ultimately, should give our majors a competitive advantage in the employment marketplace. Employment opportunities extended this year's graduating class signify the department's maturity.

The economics faculty continued to produce a voluminous amount of scholarly research. A quantitative summary of this year's research tallies four books, nine grants completed, 52 articles published in professional journals (with 12 more in review process), 22 presentations before professional organizations. Six faculty members served as either discussants or chairpersons at national meetings. These research accomplishments do not include the number of prior articles translated in reprints, the six on-going grants (funded by such agencies as the U. S. Department of Labor, DuPont, WRRI, Policy Research Associates, and the National-Right-to-Work-Legal-Defense-Foundation), nor the academic conferences that were organized by and participated in by the economics faculty.

The Economics Department continued to provide educational opportunities to the citizens of South Carolina to learn economics in courses and workshops offered by the Center for Economic Education, and by lectures and speeches given by economists to more than 100 civic and professional groups. Economics topics continued to be in the headlines, and the department made a sincere effort to inform the public of the basic issues with particular emphasis on issues that reduced personal economic freedoms.

Several economists received national recognition during the year. Prof. Holley Ulbrich received the Freedom Foundation's Award
for Economic Educators. She was chosen over all the economic educators in the United States for her contributions to advancing economic education and for developing the center at Clemson. Prof. Bruce Yandle brought acclaim to Clemson by being appointed to the American Enterprise Institute’s Research Advisory Committee, the Cost Methodology Panel of the National Commission on Air Quality, and the Controlled Trading Research Group of the Environmental Protection Agency. Prof. Richard B. McKenzie was a guest on the McNeil/Lehrer Report on national television and debated the issue of plant-closing legislation.

Weekly editorials written by the economics faculty now appear in more than 23 newspapers throughout the South. In addition, economists provide a monthly column in “The Textile Marketing Letter.” Faculty members were also interviewed by radio, newspaper and television reporters on their views on current economic issues affecting our State and the country. These are but a few of the ways the Department of Economics reaches out to the general public in an attempt to combat economic illiteracy.

The nationally recognized Center for Economic Education continued to expand its existing programs, reaching more teachers this year than ever before. “The Marketplace Newsletter,” issued quarterly, expanded its circulation to more than 1,100.

Economics 750 (Economics for Teachers) and Economics 751 (Current Issues in Economics for Teachers) were offered in the evenings and during the summer to enable teachers to become better acquainted with the American economic system.

Teacher workshops and in-service programs continued to attract public school teachers wishing to learn more about specific economic concepts and to show how economic concepts can be integrated into their classes.

Public school students, too, benefited from department efforts through a special program funded by the National Science Foundation that brought gifted high school students to the Clemson campus for a six-week program to teach them basic economics and to give them an advanced look at college life.

This year the departmental learning lab became fully operational for the first time. Tape lectures, slides, computer applications and study guides were administered by graduate students to those students either in need of additional instruction or wanting to review certain topics. Preliminary results are very encouraging as to its educational value.
The department was very fortunate to have Prof. Wilfred Beckerman as a Visiting Alumni Professor during the spring semester. Prof. Beckerman, a holder of the second oldest economics chair in England, brought national attention to the department and provided the faculty with an entree to the prestigious economics departments across the United States.

Department of Textiles

The Textile Department has maintained balanced programs in teaching, research and service. Emphasis has been on going beyond normal duties and attaining the simply stated objective of becoming the leading center for textile excellence worldwide. As demonstrated evidence of this emphasis, academic accomplishments beyond teaching undergraduate students in three curricula and graduate students in three programs included publishing 26 papers in refereed journals or industrial organs and delivering 34 presentations before learned bodies, industrial assemblies, academic gatherings or civic organizations. These publications and presentations reflect an extensive breadth of science and technology including polymer synthesis, instrumental analysis, fiber performance, yarn processing, fabric formation, dyeing innovations, manufacturing environment, energy analyses, industrial hygiene, and aesthetics.

Research work beyond traditional guidance of undergraduate projects and graduate theses and dissertations resulted in the submission of 16 proposals for outside funding. Nine of these proposals were written to basic textile industry firms. Presently 14 sponsored research programs are under way. The scope of current research encompasses basic fiber chemistry, fundamental textile engineering and technology, advanced instrumental analyses, technical personnel training, and innovative manufacturing techniques.

As service to the textile industry, 58 short-term projects were undertaken and completed. Many of these projects became the nucleus for future research proposals, and most strengthen bonds among the public, industry and the University. The majority of recent service projects have involved testing and/or evaluation analyses for basic textile manufacturers. Individual textile faculty worked in advisory capacities for 39 different organizations, including two major textile trade associations, and assumed leadership roles in the organization and implementation of technical and service programs under professional society, industry and trade association auspices. In addition, textile faculty chaired and/or
lectured in 26 professional development seminars which attracted 1,259 participants as of June 30, 1980.

The faculty and staff are truly dedicated, productive professionals. Their potential creativity and expertise is an asset to South Carolina. Efforts are being made to communicate the value of textile education to the public, industry and youth of South Carolina so that future textile leadership can be assured.

Professional Development

The Professional Development Program was well received during the year. Its 135 continuing education programs in accounting, management, textiles and economics were attended by 4,248 paid participants. As the year closed, completion of the second phase of renovation of Sirrine Hall allowed the occupancy of two new seminar rooms and a lounge designed specifically for Professional Development attendees. Revenues generated in the program paid for the finishing of these facilities.

More than 1,000 different companies enrolled employees in Professional Development areas, and the top five organizations in terms of attendance were DuPont, Clemson University, J. P. Stevens and Co., Celanese, and Owens-Corning Fiberglas.

During 1979-80 the Professional Development Office presented 16 in-plant programs which were tailored to the unique and special needs of a particular organization.

The Professional Development Office updated the office technology used to serve program participants by purchasing an IBM Office Systems Word Processing Unit. Productivity as well as quality levels have increased through the use of this new capital equipment.

Members of the Professional Development staff were invited to participate in continuing education conferences sponsored by other universities. Staff members participated in programs held in Oklahoma, Florida, Tennessee, New Hampshire and South Carolina. The professionalism and competence of the Professional Development staff at Clemson is becoming recognized nationwide as indicated by these various invitations to participate in the conferences.

In the in-plant area several unique programs were developed. These included a week-long executive development program for the J. E. Sirrine Co. This seminar was held at Lake Lure, N. C., and lecturers included Clemson faculty members plus various key individuals from J. E. Sirrine Co. Also during the year a perform-
ance appraisal program was presented for the U. S. Army at the Anniston Army Depot in Anniston, Ala. Another unique program included developing a "German for Reading Knowledge" program for the Badische Co. in Anderson. The 4th annual "Management Training and Development Workshop" was held for the Multimedia Corp. with participants representing the various Multimedia properties.

In October 1979 Clemson President Bill Atchley welcomed the 25,000th Professional Development participant to campus. Serving this many participants represents a major milestone in the office's development and is also indicative of rapid growth since more than 80 percent of these attendees were generated during the last six years.

Another development relates to the large number of Professional Development programs which have been designed to meet the growing needs of working women. "Professional Development for Secretaries," "The Woman Manager," and "Women Moving into Management" workshops were developed. These programs are in addition to the other workshops which are already serving the special training and educational needs of women.

The Professional Development Office worked with a number of the University's other colleges in presenting continuing education programs. These efforts included a "Route Location Workshop" for the College of Forest and Recreation Resources, a "Fabrics and Geotextiles in Civil Engineering" program in cooperation with the College of Engineering, and an "AGC Construction Supervisor Training Program" in conjunction with the College of Architecture. The office also co-hosted the "Fifth Annual Economic Outlook Conference," which attracted 452 attendees, and also hosted the "Annual Boy Scout Staff Planning Conference" in Sirrine Hall.
COLLEGE OF LIBERAL ARTS

It’s been said that no university can ever become a great institution of higher learning without a strong program in the humanities and the social sciences. The College of Liberal Arts recognizes that dictum; it is founded on the idea that a self-governing society requires of its citizens a basic general education which will enable them, regardless of their occupational or professional interests, to lead fuller, more useful lives and to contribute to the general welfare.

But even with these lofty ideals, the College of Liberal Arts, like all colleges at Clemson, is steeped in a tradition of practical endeavor. Though only about nine percent of the student body major in Liberal Arts fields, the faculty of the college teach almost a third of the credit hours taken by the student body. This underscores the importance of the college’s courses to all curricula in the University.

The college is made up of the departments of English, Modern Languages, History, Music, Political Science, Psychology and Sociology. All departments except Music offer the Bachelor of Arts degree; English and History offer the master’s degree as well.

Seventy percent of the faculty hold doctoral degrees. Graduates of the college readily enter the outstanding graduate and professional schools of the country.

Service

The college’s public service role throughout the State and the area continues to grow. The departments of Political Science, Sociology and Psychology are frequently called upon by units of State and local government for advice on problems of poll-taking, tax matters, government organization, the impact of industrial development on society, and mental health and alcoholism among others. Members of the Department of English have proven very valuable to industry by conducting seminars in technical report writing.

The Department of Languages continues to stress a practical, business orientation by encouraging Clemson students to minor in a modern language while majoring in business administration, engineering or textile science. Given the large foreign investment in South Carolina industry, this is an important career option for the State’s students.
The Languages Department annually sponsors "Dionysia," a foreign language drama festival with several dozen casts from four states competing in four languages. It also sponsors a Language Declamation Contest which in 1979 drew 341 participants from several states. The department also conducts foreign study programs in France and South America.

Through the Robert A. Taft Seminar in Government, the Department of Political Science provides the State's teachers with practical knowledge of how government works, and arms them with information for involving young people in government decision making. Improved energy education in South Carolina's public schools is the goal of the Energy Institute, also conducted by this department, with funds from the U. S. Department of Energy. Thirty science and social science teachers from South Carolina secondary schools participate in this summer institute annually.

The Model United Nations program, housed in the Department of Political Science but with students participating from throughout the University, annually competes with outstanding success in either the Harvard University or National Model United Nations program in New York.

The Department of English annually presents a well-known and widely attended Children's Literature Symposium. It also conducts an innovative course designed to give special instruction to freshmen with poorly developed verbal skills, in addition to conducting a writing laboratory open to students with any type of writing deficiency. A minor concentration in communications has been especially popular. Members of the department serve regularly as program leaders for the South Carolina Committee for the Humanities.

An important contribution of the college to the University generally is sponsorship of a large number of student and University organizations and extracurricular activities.

The Department of English sponsors the Clemson Players, the student drama group that annually presents four public productions to capacity audiences, the Debating Team, and assists with management of student publications including "The Tiger," "The Chronicle" and the "Calhoun Literary Review."

The Department of Music sponsors and manages the University Concert Series, the Liberal Arts Chamber Music Series, and student musical organizations—the "Tiger" Band, the Concert Band and the University Chorus. Faculty of the Music Department regularly
act as resource people, performers and adjudicators in the State and the area.

**Professional Activity and Scholarship**

Two publications of national interest emanate from the College of Liberal Arts. The "South Carolina Review" is edited and published by the Department of English. This distinguished journal provides a forum for distinctive literary scholarship and original poetry and fiction. A $1,500 grant from the Coordinating Council of Literary Magazines helped underwrite the cost of publishing 1,400 copies of the journal this year.

"The Journal of Political Science," with an international editorial board under the editorship of the Department of Political Science, boasts a list of authors from leading universities and colleges throughout the United States and overseas.

The Department of History continues to spread the name of the University through a free, syndicated book review column published in 89 newspapers in 38 states with a readership of three million people. This history book review service is the only such regular newspaper feature sponsored by an institution of higher education. The department also sponsors three popular radio programs: "Plots and Prologues," dealing with the performance of opera and its relationship to history; "The Latin Beat," covering the wide range of Latin American music; and "Women—Themselves," a unique approach to women's history. The last named program is supported by a substantial grant from the South Carolina Committee for the Humanities, which also allows the department to bring scholars in women's history to the campus for a series of live presentations. All of these radio programs are broadcast over the South Carolina Educational Radio Network as part of the department's public service effort.

Members of the Psychology Department faculty are conducting research on such topics as jogging and prepared childbirth, with federal funding from Biomedical Research Support Grants through the University.

Scholarly gatherings are regular features of the activities of the College of Liberal Arts. In 1979-80 the Department of Psychology hosted the annual meeting of the Southeastern Society for Social Psychology, and the departments of English and Modern Languages jointly hosted the spring meeting of the Philological Association of the Carolinas.
The College of Nursing continued to emphasize high quality programs. Significant advancements were made within the college during the year.

Undergraduate Programs

Baccalaureate Degree Program

The faculty were engaged in curriculum development, including the identification of clinical objectives. Attention continued to focus on clinical practice. A former member of the Evaluation Department of the National League for Nursing presented a second workshop for the faculty in January, and a faculty retreat was held in May.

Closed-circuit television was continued for use in teaching. Several videotapes were developed.

One instructor presented a regional nursing workshop and also presented a program at the American Nurses' Association Convention. The director of the baccalaureate program co-authored a guest editorial in "Nursing Research."

During the 1979-80 academic year, 108 new students were enrolled in the Baccalaureate Degree Program; 77 received the Bachelor of Science degree in May.

Associate Degree Program

The Board of Trustees voted in January to terminate the Associate Degree Program as of July 1, 1982. The action was based on the decision that the two-year program does not fit the University's mission and would be more appropriately administered by a technical college.

Enrollment in the Associate Degree Program at the start of the 1979-80 academic year was 82 students. Of this number 10 were licensed practical nurses. Thirty-six students received the Associate in Arts in Nursing degree. Graduates are employed as staff nurses in community hospital agencies, primarily within the region adjacent to the University.

The nursing faculty have been reviewing for the past year many facets of the curriculum. An on-going evaluation took place in the areas of program philosophy, objectives and purposes as they will relate to the NLN Self-Study Report.
Graduate Program

During the period three new students enrolled for the fall 1979 term and one for the spring 1980 term. Master of Science in Nursing degrees were awarded to four students during graduations in August and December. Second-year students numbered four, and four were engaged in thesis research, having completed all the course requirements.

F. Madelynn Oglesby, Ph.D., was appointed director of the Graduate Program and assumed her position June 4.

The program received a $26,000 professional nurse traineeship award which was shared by eight full-time students.

Department of Continuing Education

In its third year of operation, the Continuing Education Department of the College of Nursing awarded CEU's to 686 nurses enrolled in 31 separate continuing education offerings.

Emphasis has continued to focus on designing offerings which recognize the varied educational backgrounds and specific interest areas within the occupation of nursing. Specific offerings were designed to meet the continuing education needs of licensed practical nurses, registered nurses (prepared at the various education levels), public health staff nurses, ADN faculty, and registered nurses with earned doctorates in nursing or related fields.

The fifth and final year of the Critical Care Nursing/Continuing Education Project was funded by a grant from the Appalachian Region. During this year, more than 420 nurses expanded their knowledge and enhanced their skills in critical care nursing through the project. Since 1977 a gradual process of integration of the major elements of the project into the College of Nursing has taken place. The goals and activities initiated through the EMS project are now incorporated into those of the Continuing Education Department.

Under contract with South Carolina Department of Health and Environmental Control, the videotape series "Community Health Nursing: The Family—The Basic Unit of Care" was completed. A study guide to accompany the 12 sessions was written, edited and published. Ten of the 12 sessions in the series were aired over the Health Communications Network to DHEC district offices and other viewing sites. More than 100 staff nurses employed by DHEC enrolled in this unique series in which each participant worked closely with his/her public health nursing supervisor in
completing assignments related to the videotapes. The DHEC series terminated with a post-test in September 1980. Requests have been received from other institutions to preview and possibly purchase the series.

Thirty-one participants, including counselors, teachers, school health nurses, hospital staff nurses, ministers, recreational therapists and social workers, completed the interdisciplinary offering on "Counseling Teenagers." A public service offering on cardio-pulmonary resuscitation enabled seven members of the Clemson area community to be certified by the American Heart Association in basic life support.

Department of Nursing Research

Two projects were funded by the Clemson University Faculty Research Committee:

- Study of the Effects of Progressive Relaxation Related to Test Taking in Students of Nursing. Investigators: Ellen Schultz, Instructor, and Barbara Barham, Visiting Instructor.

Several faculty members submitted abstracts of completed research to "Abstracts in Nursing Research in the South" published by the Southern Regional Education Board.

One instructor has had a manuscript of completed research accepted by the journal "Nursing Research." "An Evening of Research" was sponsored by the Gamma Mu Chapter of Sigma Theta Tau.

Information regarding sources of grant funds is sent periodically to the faculty. Information is also posted on bulletin boards regarding conferences and seminars.
This year brought final approval of the Bachelor of Science and Master of Science degrees in Computer Science.

The number of majors in scientific disciplines has remained essentially constant, probably due to interest in health, environment and energy problems. However, due to an increase in majors in other technical curricula, the demand for introductory classes in all the sciences continues to expand each year beyond expectation and prediction. The College of Sciences provides the basic courses for these curricula, a teaching load of 30 percent of the University total, done by 23 percent of the faculty.

The faculty in the sciences have $3,690,994 in contract funds from federal agencies and industries to support their research. Many are officers of and active in national scientific societies.

**Biology Program**

During the 1979-80 academic year 1,600 students were enrolled in courses offered by the Biology Program. The Teacher Information Processing System computer program was implemented to assist with instruction.

The first South Carolina Biology Merit Exam was organized and conducted by the Biology Program faculty. Approximately 460 high school students and 50 high school teachers attended the event.

An advisory committee composed of representatives from the departments of Biochemistry, Botany, Microbiology and Zoology was appointed to review biology course content and operations. This committee will facilitate communication with all departments.

The faculty participated in programs of the South Carolina Science Council, National Science Teachers Association and Association for Biology Laboratory Education. Lectures, tours for high school students and courses in advanced placement biology for high school teachers were conducted.

Four new laboratory manuals were published by the Biology Program faculty.

**Department of Biochemistry**

The Bachelor of Science degree program enrolled 54 students, and 23 pursued graduate degrees in biochemistry. Nearly 700 students were enrolled in biochemistry courses. Three M.S. and 10 B.S. degrees were awarded. The first graduates of the Ph.D. program established in 1973 are now doing postdoctoral research.
One faculty member received a prestigious Fogarty International Fellowship to study blood serum protein at Oxford University, England, during his sabbatical leave.

Eight outside research grants were held by faculty members, three from the National Institute of Health, and one each from the National Science Foundation, Muscular Dystrophy Association of America, Water Resources Research Institute, American Heart Association and Research Corporation. Grants in force totaled more than $400,000. The projects included research dealing with muscular dystrophy, complement, cellular energy regulation, and herbicide degradation.

Papers were presented at two international meetings, four at national meetings and five at regional meetings. Five manuscripts were published.

Prof. Howard K. Schachman, University of California, Berkeley, an internationally known scientist, visited the department and offered a one week short course on ultracentrifugation.

Department of Botany

The Botany Department experienced an interesting and productive year brought about, in part, by the addition of two new, young, enthusiastic botanists in the fields of mycology and ecology. Prof. Linda Kohn, who came to Clemson from Cornell, has restructured the mycological offerings of the department bringing greater emphasis to the higher fungi. Prof. Kim Peterson, previously at Duke University, is carrying out research on the role of the Arctic tundra in the carbon dioxide balance of the world. His first year in residence saw him funded by NSF to carry out this project. Prof. Peterson has also restructured the course offerings in ecology, increasing diversity at the 800-level in that area.

The department reached somewhat of a milestone in grants in effect this year. Seven of the eight members were supported from a number of sources, including NSF, ERDA, WRRI, the Corps of Engineers, World Health Organization, South Carolina Public Service Authority, as well as the Faculty Research Council. Research efforts run the gamut from those mentioned above to the development of a prototype greenhouse which uses heated water from an electric power plant; a vegetational survey of the Richard B. Russell dam site; development of equipment for measuring growth increments in algae by use of the lasar; ecology of aquatic plants and development of fungal pathogens as mosquito control vectors.
Special plaudits go to Prof. L. A. Dyck, who with his students read six papers at the national Phycological (algae) Society meeting this year.

The department graduated four students with an M.S. in Botany during this year. There now are 13 students in the graduate program at the Master’s or the Ph.D. level. Graduate enrollment could be increased by offering more graduate assistant stipends. It is unfortunate that the department can’t offer qualified applicants more during this period of rising costs.

Department of Chemistry and Geology

This has been a productive year for teaching and research activities in the department.

Research grants and contracts awarded in chemistry were funded by U.S.-Israel Binational Foundation and Dow Chemical Co., NIH, Los Alamos Scientific Laboratory, Research Corp., and the Department of Energy. The National Science Foundation provided a grant for undergraduate research participation permitting 10 students to carry out research at Clemson during the summer months. In geology a continuation grant was received from the Office of Water Resources and Technology.

A research equipment grant was received from the National Science Foundation for the purchase of a 90 MHz Nuclear Magnetic Resonance Spectrometer. The acquisition of this versatile instrument will enhance our research productivity significantly.

The continued improvement in the instrumentation and the level of external funding has improved the department’s research productivity. During the year the chemistry faculty published 33 papers and one book, presented 25 papers at scientific meetings, and gave 38 invited lectures. The geology faculty published five papers, presented seven papers at scientific meetings and gave five invited lectures. The departmental seminar program continues, and the Distinguished Chemical Industry lecture series completed its second full year successfully.

The faculty continues to develop its research and teaching potential. Three new chemistry faculty members and one geologist begin work next year. All have submitted research proposals before arriving and have been provided enough equipment to transfer or initiate research programs, although additional equipment will be necessary to develop the mature research programs needed at Clemson.
One faculty member is using sabbatical leave to perform research at the Office of Naval Research. Another returned to National Institutes of Health for the summer to continue cancer research initiated during a recent year of work there, and yet another was appointed a visiting staff member at the Los Alamos Scientific Laboratory. The department head was appointed UNESCO consultant to the State University of Campinas, Campinas, Brazil, to advise and assist in development of their postgraduate program in chemistry.

**Department of Computer Science**

During its second year of operation, the department continued recruiting new faculty and revising courses and curricula. Efforts began to develop a departmental computer laboratory.

The highlight of the year was the approval in April of the proposal for B.S. and M.S. degrees in computer science. Plans were completed for full implementation of the B.S. program for fall semester 1980, with 150 to 200 majors expected initially. The M.S. program will be implemented on a very limited basis, however, due to the late approval of the program, the lack of graduate assistantships, and a shortage of faculty.

The shortage of faculty continues to be a major problem. Additional permanent positions are difficult to obtain, and the demand for Ph.D. faculty in computer science is approximately 10 times greater than the supply.

A departmental computer laboratory was established during the year with the acquisition of an IBM Series/1 mini computer. A high speed line printer was added during the year. The initial acquisition of some microprocessor equipment was also completed.

During the academic year, 1,820 students enrolled in courses offered by the department, an increase of 18 percent over the previous year and 40 percent over the past two years. Only five sections of these courses were taught by faculty in the Department of Mathematical Sciences, as compared to 29 sections during the previous year.

**Department of Mathematical Sciences**

The fall 1979 undergraduate credit hour production of the Mathematical Sciences Department was one-eighth that of the entire University. The number of undergraduate majors in the B.A. and B.S. programs of the department grew by 20 percent over fall 1978 to 286. At the August 1980 commencement exercises, the one hundredth
graduate of the department's applications-oriented master's degree program received an M.S. degree from Clemson. Three graduate students who had dissertation advisers in the Mathematical Sciences Department received Ph.D. degrees from Clemson. Two of these three earned their degrees in the Management Science Ph.D. degree program which the department administers jointly with the Industrial Management Department.

On Nov. 30, 1979, the department concluded activities on its four-year NSF grant, "An Alternative in Higher Education in the Mathematical Sciences." With grant support, the department's master's and doctoral degree programs were restructured to produce graduates with career opportunities in business, government and industry. Programs such as ours have been hailed as providing the direction in graduate education in the mathematical sciences for the eighties. The project director for the grant, through membership on the Executive Council of the Conference Board of the Mathematical Sciences and other memberships, has become highly influential in educational policy recommendations in the mathematical sciences. The associate project director is chairman of the Education Committee of the Society of Industrial and Applied Mathematics.

Because of the grant, faculty of the department have moved from the position of having negligible influence on national mathematical sciences educational recommendations to one of exerting a strong voice. Since September 1975, faculty of the department have made 13 presentations to national audiences, and more than 25 visitors have come to Clemson for a semester or more to observe or participate in our graduate programs. A copy of the NSF-supported publication, "New Opportunities in Applied Mathematics," containing detailed information about the Clemson mathematical sciences graduate programs, was sent to every mathematics department in the United States and Canada.

The department's contract with the Office of Naval Research continues into its 10th year at a significantly increased funding level. Statistical sampling procedures developed under the contract have been used by the U. S. Navy to evaluate contracts involving billions of dollars. Prof. K. T. Wallenius, principal investigator for the contract, was named by the Clemson University chapter of Sigma Xi to receive its first faculty research award.

The department's external research funding has increased markedly during 1979-80 with the ONR contract, two NSF grants, a grant through HEW, a NASA grant, and another contract through
our continuing cooperative research agreement with the USDA. Additionally, the department’s discrete structures research proposal has been selected for inclusion in the State of South Carolina proposal now pending in the NSF Experimental Program to Stimulate Competitive Research in the Sciences. If funded, the proposed research will be supported through 1985.

Four new faculty have completed their first year of service with the department, one in the role of associate head. Two have been awarded research grants. The other has been selected to give the principal research address at the next annual meeting of the Southeastern section of the Mathematical Association of America.

Department of Microbiology

Thirty-four B.S. and nine M.S. degrees were awarded with a major in microbiology. The recipients were successful in obtaining employment or proceeding for further education in graduate or professional health schools throughout the nation. The breadth of the graduate program was increased by addition of two new courses. One deals with microbial diseases of man, the other with genetic engineering.

This year was the most productive one, with respect to research, since establishment of the department in 1971. Faculty had 15 research papers published in national or international journals, and 25 scientific presentations were made at meetings of professional societies. Also, a number of invited seminars were presented at various universities and industrial research groups. One faculty member spent five months, by invitation, conducting experiments in genetic engineering at the National Institutes of Health in Washington, D.C. He also collaborated in presenting a two-day workshop in recombinant DNA techniques and applications, sponsored by the American Society for Microbiology.

A variety of new research projects were begun. One deals with the microbiology of dental caries. The objective is to better understand, and subsequently control, the microbial intervention in man’s natural immunity to tooth-decay causing organisms. Another is an investigation of microbial disease of eels being grown in commercial mariculture operations. This fish is becoming an important food export item for South Carolina, and the goal of the research is to reduce losses from microbial infections. Several projects dealing with biological systems for generating energy are under way. The possibility of converting waste paper in municipal refuse to ethanol is being studied. The ethanol generated could then be
mixed with gasoline to furnish gasohol. Many pesticides find their way into the sediments of natural bodies of water. Whether or not these chemicals are degraded are being investigated. It is important to know the fate of pesticides in our environment if we are to use them safely.

An important collaborative effort was initiated between the Department of Microbiology at Clemson University and the Department of Microbiology and Immunology at the University of South Carolina, Columbia. Since the faculties of the two departments have strengths in very different areas of microbiology, it has been informally agreed to maximize the use of these faculties in the education of students. There has been an exchange of seminar speakers between the two departments and a two-day visit to the USC facilities by some 80 Clemson students. Plans are being made to exchange faculty to present short courses in their specialized areas. This approach will improve the quality of both programs at minimal expense.

Department of Physics and Astronomy

During the 1979-80 academic year the instruction, research and public service programs of the department were active in contributing to the University's educational objectives.

Increased enrollment of engineering students raised the level of teaching activity to an all-time high. A total of 13,965 student credit hours were taught, up 26 percent from five years ago. Increased emphasis nationally on energy research and defense-related technology is expected to contribute to a long-term trend of increasing activity in science education.

Two very large research grants were obtained by the department during the year. The first, a three-year grant of $142,000 from the National Science Foundation, is for research on the properties of metallic substances in the form of thin whisker samples. Such samples have exceptional crystalline perfection and allow the investigation of many physical effects that would otherwise be difficult or impossible to observe. The second, a three-year grant of $206,000 from the National Institutes of Health, is for research on biological effects of DNA-protein crosslinks.

The level of external federal funding for research has now risen to about $200,000 annually, which is about four times what it was five years ago. Active research programs in solid-state physics, theoretical physics, biophysics, atmospheric physics, astronomy and astrophysics are in progress.
In the public service area, the department’s planetarium continues to excite widespread public interest. Its presentations were attended by more than 5,000 persons during the past year. Attendees include elementary and high school students, clubs and other interest groups. Shows are available to organized groups free of charge by appointment.

Department of Zoology

In the 1979 fall semester, 133 students were pursuing the B.S. degree in zoology. Twenty graduate students were enrolled in the M.S. program and 22 in the Ph.D. program. Zoology has the largest doctoral program at Clemson. During the period 1978-79, 29 students graduated with a B.S., five with an M.S. and two with the Ph.D. degree. The second Byron Ross Ingram Memorial Scholarship was awarded, and an August doctoral graduate won both a Herbert and Betty Carnes Award and a Marcia Brady Tucker Award from the American Ornithologists’ Union. Another doctoral student received a Sydney L. Wright Fellowship and a Slocum-Lunz scholarship.

Our research and training activities were supported by 13 outside grants or contracts (three from the National Science Foundation, two from the National Institutes of Health, two from the U. S. Department of Agriculture, two from the U. S. Army, and one each from the Air Force Office of Scientific Research, Electric Power Research Institute, U. S. Fish and Wildlife Service, and U. S. Department of Energy). More than $480,000 of new research funds were committed during the year. Over the last five years, the department has attracted outside money exceeding $1.1 million as its research program has grown. Small grants received during the year included two from Sigma Xi to doctoral students. Scholarly activities by faculty and students during the year included 31 papers presented at international, national and regional scientific meetings and 14 manuscripts (excluding abstracts) published in scholarly journals.

Several members of our faculty have served in special professional capacities as members and officers of the Animal Behavior Society, the Wilson Ornithological Society, the Fourth International Symposium on Meiofauna, the Board of Reviewers for the “Transactions of the American Microscopical Society,” the Board of Scientific Advisors of the Highlands Biological Station, and the State Rhodes Scholarship Selection Committee. One faculty member has served as an expert witness for South Carolina on the Rich-
ard B. Russell Dam project, and another continues as an associate editor of the "Journal of Experimental Zoology" and organized a symposium on fish development for the American Society of Zoology.

During the year, faculty members were invited to give at least eight seminars at other institutions, and 18 outside speakers visited our campus and presented seminars to our faculty and students.

With the assistance of a recent architecture graduate, we have developed plans for a Piedmont Field Museum to house our animal collections and other systematic collections of the University. This common facility will be dedicated to teaching, research and public service through continuing education.

GRADUATE STUDIES, UNIVERSITY RESEARCH AND COMPUTER CENTER

The Graduate School

Enrollment for fall semester 1979 dropped approximately 10 percent relative to 1978. However, enrollment grew in the M.A., M.S. and Ph.D. degree programs while most of the decrease was in the "undeclared majors" category. Total enrollment was 2,080 with 203 in doctoral programs, 544 in M.A. and M.S. degree programs, 819 in professional master's programs, 51 in education specialist degree programs, and 463 students with undeclared majors. Of the total enrollment, approximately 500 were enrolled off campus. In addition, 190 students were enrolled in the Clemson-Furman MBA program.

A total of 614 advanced degrees were awarded during the academic year, 29 of which were doctor of philosophy degrees.

The third annual workshop for graduate advisers was held in late August 1979 and was attended over the two-day period by approximately 75 faculty and staff.

Major accomplishments of the Graduate Council include: formulation of guidelines for admission of international students; revision of the policy governing the time limit for completion of the doctoral degree and validity of the comprehensive examination; and formulation of guidelines for selection of Graduate Alumni Fellows.

Office of University Research

The Office of University Research is responsible for providing information and assistance concerning all aspects of the University research effort to faculty members, departments, colleges and other
administrative units. Assistance is provided in the preparation and submission of applications for sponsored research, instruction and public service programs. During 1979-80 the office processed 325 proposals of all types on behalf of the faculty. The office provides University liaison between the institution and all public and private, national and local organizations and/or entities concerned with any aspect of research support, regulation or administration.

Guidance and executive support were provided to the University Committee for the Protection of Human Subjects (41 active projects); the Biomedical Research Support Grant Committee (16 active awards); the Faculty Research Committee (58 active awards); and the Laboratory Animal Welfare Committee.

**The Computer Center**

Steady progress has been made in 1979-80 in improving the Computer Center's service to its customers. The year has been relatively trouble free with few new problems arising.

Most of the center's peripheral equipment has been replaced, including the tape drives. Half the network of Braegen terminals was also replaced as the terminals were withdrawn from service to be used as spares for those remaining. Barring some catastrophic equipment failures, the problem of maintaining the Braegen network appears to have been taken care of for the next two or three years.

Two new remote sites were opened in 1979-80, and the open hours of two others considerably expanded. Eight terminals and a printer were placed in Brackett Hall, and 16 terminals and a printer in Riggs Hall. The open hours of the Sirrine and Lee remote sites were expanded to be the same as the main center.

Some adjustments have been made in the center's organization to provide better support to the user community. A good deal of difficulty was experienced in providing the necessary manpower to service terminals because of the need to keep someone troubleshooting problems with the teleprocessing network. This has been addressed by taking a position from the systems group and adding it to the teleprocessing group. Systems also gave up a position to the Division of Administrative Programming Services (DAPS) and therefore suffered a net loss of two positions during the year. Two positions have been transferred from Operations to Academic Computing Support, raising to nine the number of full-time employees in the latter group.
Staff turnover has been about average. It is becoming increasingly difficult to attract qualified applicants for vacant positions, and the average age of center employees remains extremely low. While we have not been badly hurt by it yet, staff turnover is a potentially serious problem.

A great deal of time and effort has gone into developing a performance planning and evaluation system for center employees. Each one now has a performance plan which is used as the basis for the annual review. All State job descriptions have been re-written to accurately reflect current duties.

Staff members have been encouraged to make presentations of their work at professional meetings, and at least six such presentations have been made in the past year. The center is gaining a national reputation in both the systems and academic support areas. Research and development will continue to be stressed, with microcomputer applications becoming of increasing importance.

A new suite of offices is being built in the basement of the P&A Building which will help solve space problems. Unfortunately, that extra office space was acquired at the expense of storage space. Tape storage is almost exhausted, and this problem has been addressed by imposing a tape storage charge. It is too early to judge the effectiveness of the charge in reducing the demands for tape storage.

Computer use has increased 123 percent over the past year (CPU time). The increased level of service together with increases in maintenance and paper costs (the 80-81 State contract price for paper is up 26 percent over the 79-80 price) would normally be expected to strain the University’s financial resources. Fortunately, however, budget increases have been more than offset by the increase in outside income. The difference between the center’s budget and outside income has decreased from $899,244 in 1977-78 (47 percent of the center’s budget) to $662,376 in 1979-80 (28 percent of the total). The Computer Center is therefore costing the University significantly less now than it did in 1977-78.

The major outstanding problem is that of providing sufficient air conditioning for the machine room. Work is under way with the Physical Plant to solve the problem, although it appears that the problem may not be solvable in the present building.

Division of Administrative Programming Services

The Division of Administrative Programming Services is responsible for developing and maintaining computerized information systems to meet the needs of the University administration. The
division consults with administrative departments and assists them in designing computerized and manual systems to support routine operational needs as well as management decisions. A key ingredient in DAPS' mission is to design coordinated systems for various departments that revolve around an integrated University database. Administrative areas do not operate in a vacuum, but rather support each other through procedures and information in discharging their responsibilities. This fact must be taken into account as DAPS designs systems that support administrative areas. During the 79-80 fiscal year, DAPS has implemented the following systems and accomplished these tasks:

1. Revised the payroll system with new project accounting and time recording features to streamline internal procedures and meet demands placed on grant and contract reporting by the federal government.

2. Designed an integrated student information system that goes from the admissions process through registration and enrollment. Plans are in place to expand the system this year to include grade recording and graduate student information.

3. Made major enhancements in the Position Control and Budgeting systems to retain position status and funding information on a more timely basis and to integrate the personnel and budget processes relating to position status and funding.

4. Expanded the network of terminals in academic/administrative areas to allow on-line access to certain personnel and accounting records.

5. Implemented an on-line system that allows administrative departments to maintain tables used in information systems. These include such tables as all dormitory rooms and valid major courses of study.

6. Implemented a method to collect course request information at preregistration time using optical mark reader equipment.

7. Performed the general design of a material control and purchasing system for Physical Plant materials. Implementation of this project will be in the 1980-81 fiscal year.

8. In consultation with several deans, completed the conceptual design for a student curriculum progress report.

9. Placed all systems development and maintenance under a three-year plan that is revised yearly. All projects in the department are controlled by this plan.

10. Assisted in administering locally the statewide cost-of-living raise effective June 20, 1980.
11. Several departments have worked with DAPS in installing, using and planning for word processing equipment. DAPS has assisted in ensuring that word processing hardware and procedures are used effectively in conjunction with existing or planned information systems.

12. Continued to enhance our integrated data dictionary to serve as an inventory of the names and definitions of all University data elements. This dictionary also serves as an inventory and cross-reference of all systems, data items, project leaders and programs.

13. Enhanced the standards by which on-line systems are developed and published as part of the departmental standards and procedures manual. Also upgraded other standards for system implementation.

14. Continued to encourage the use of computer output microfiche (COM) in order to save the cost of printing reports on paper and the cost of storing this paper.

15. Converted several terminals to teleprocessing software that will greatly enhance their effectiveness for use on administrative systems. In the past, all administrative systems have operated under terminal control software designed primarily for academic use.

16. Continued to perform routine system maintenance on more than 50 administrative application systems to ensure effective user support.

17. Participated in a review of the operation and information needs of the Robert Muldrow Cooper Library and the preparation of a document outlining a plan for implementation of an integrated library information system.

18. Completed a study of the accounting procedures in the College of Engineering in order to recommend enhancements to University systems to serve their particular needs.

19. Expanded several administrative systems to communicate via magnetic tape with agencies requiring the University to file certain reports.

20. Completed a study of the University's requirements for employee retirement information and formulated plans to implement a retirement information system in the 1980-81 fiscal year.

21. Continued to enhance existing administrative systems to take advantage of new software and hardware capabilities acquired by the Computer Center.
In conclusion, there are three key points emerging as DAPS continues to design and support administrative systems:

1. All systems must be developed in a coordinated fashion around a central University database, recognizing the fact that administrative areas work in a supportive fashion and share information and procedures.

2. Information systems development must be a joint effort of DAPS and the using department(s). A systems effort cannot be effective without the understanding and effort of all affected parties.

3. Information in administrative databases must be made more readily available to all University departments having authority to use it, not just the department responsible for inputting it. On-line systems recently developed and improved security procedures are making this more feasible.

Division of Information Systems Development

The Division of Information Systems Development (DISD) was established at the University in 1974 to provide skilled assistance to governmental agencies in the design, implementation and production maintenance of computerized information systems. During the year this division continued to provide vigorous assistance and support to the special needs of the University and other governmental agencies as a backup support for State government.

Contracts during the year included:

Division of Administration - Office of the Governor—Maintenance and continued refinement of the system continued. The system maintains records for persons trained under the Comprehensive Manpower Program.

Department of Social Services—Most of the support of DSS in its computer information systems requirements were in the area of MMIS—Medicaid Management Information System. MMIS is a large-scale on-line claims processing and reporting system that processes all types of Medicaid claims including hospitals, physicians, transportation, dental and nursing homes. Major subsystems include provider, recipient, reference, claims processing, management reporting and surveillance reporting.

Mental Health Centers—Continued maintenance and development on a system for maintenance of patient and staff records.

Landor College—Continued development and support of Lander's data processing needs in student and alumni records, payroll and course-load prediction.
Plant Pest Regulatory Service—Maintained and enhanced a system which maintains records of plant pesticides and applicators who are licensed to use them.

U. S. Department of Agriculture Cotton Testing Labs—The USDA Cotton Testing Labs test cotton fibers for such factors as strength and density. DISD continued maintenance on an automated system which performs statistical analysis of test data and helped institute procedures for more timely collection of test results.

The additional role of this division in support of governmental agencies will increase Clemson University's contribution to the State during the coming fiscal year.

THE ROBERT MULDROW COOPER LIBRARY

Library collections continue to grow in size and quality. The total count is now 801,023 volumes. In addition there are 18,797 reels of microfilm, 384,652 units of microfiche, 31,504 microcards and 13,396 serial subscriptions. Clemson has for many years been a selective depository for U. S. government publications, and to date 210,894 volumes have been assembled to meet the University's curricula and research needs.

To supplement its collections during the year, the library borrowed 2,373 items from other libraries and loaned 3,112 items to other libraries. For many years, Clemson borrowed more items than it loaned. These figures reflect the strength of the collections and library service beyond the Clemson campus.

A count is made of library users as they leave the building. In 1979-80, that number totaled 545,742. Although statistics indicate that some 192,973 books were checked out to users, this number by no means indicates the total use of the collections. Experience shows that many more books are used in the building than are circulated for use outside the building.

The extension of library hours from 11 p.m. to 1 a.m. Sunday through Thursday last year was well received by students and will be continued. Although service from the library staff is not available after 11 p.m., students have access to the collections of books, journals and documents for 106 hours each week.

Two events of the past year will help shape the future of Clemson's library service. The first is the completion of the final phase of expansion of the library building. The addition of two new floors brings the total number to six, the useable space in the building to

61
145,000 square feet, and the reader seating capacity to nearly 1,400. This final expansion should allow for the library's growth for the next 20 years. Ultimately, the building is capable of holding between 1.25 and 1.5 million volumes.

Also this year, a joint Clemson/IBM team consisting of several library staffers, members of the Division of Administrative Programming Services and members of IBM's technical staff conducted a library automation study. Three months of planning using IBM's Education Industry Application Transfer Team resulted in a comprehensive report and recommendations for the development of a Total Integrated Library Information System.

The report calls for enhancing the present circulation system by providing on-line access, establishing a comprehensive serials control system, and expanding the serials system to provide complete acquisitions and bibliographic control for the library. Efforts are currently under way to implement these recommendations.

Fundamental to plans for library development in the coming years is a commitment to improving the library service to a level compatible with other research institutions in the nation. Statistics gathered from the 26 member libraries of the Association of Southeastern Research Libraries currently rank Clemson's library 24th in both budget and staff and 21st in holdings.

This dismal picture appears even worse when one realizes that Clemson ranks much higher in terms of the number of Ph.D. programs supported. Another shortfall rests in the fact that one-third of Clemson's library collections are government publications and microfiche documents.

The problems faced by the library are intensified by an increased demand for library services. The library has begun examining how, through automation and streamlined administration, it can provide more services with essentially the same number of people.

For the average student, however, the Clemson library does appear to be well prepared in comparison to its peers. The Cooper Library ranks 14th in number of volumes per student, and 8th in periodical subscriptions per student. Also, Clemson ranks second in number of hours open per week for student use, indicating that Clemson is making a relatively small staff stretch quite far. The only other ASRL-member library open longer during the week than Clemson was the University of Florida, which was open 30 minutes longer each week and has a staff nearly three times as large as Clemson's.
Finally, the 1979-80 fiscal year ended with the retirement of J. W. Gordon Gourlay, library director for more than 25 years. During Gourlay's tenure, the library staff grew from 15 to 78 and the book budget from $35,000 to nearly $900,000. Gourlay was instrumental in planning the new library building, designed to meet Clemson's growth for many years to come.
The 1979-80 academic year marked Clemson's highest enrollment with a total of 11,748 students registered for classes—9,566 full-time and 1,251 part-time students on campus and the remaining 928 in various off-campus programs. Of the total enrollment, 2,457 were graduate students. Total enrollment has grown by more than 4,700 students in the past 10 years.

The College of Engineering was again number one in on-campus enrollment in 1979-80 with 2,453 students. The College of Industrial Management and Textile Science ran a close second with 2,324 students enrolled, and, was followed in order by Education, Sciences, Agricultural Sciences, Liberal Arts, Forest and Recreation Resources, Architecture, and Nursing. Industrial Management and Textile Science had the largest percentage increase with 14.5 percent while Engineering grew 12.5 percent. All other colleges experienced little change in enrollment.

Opportunities for higher education continued to become increasingly accessible as evidenced by the increased number of freshmen entering college with advanced standing. In the 1979-80 fall semester, 797 new high school graduates entered Clemson with advanced standing by means of College Board Advanced Placement courses (330), concurrent enrollment in high school and college (245), enrollment in summer school (Clemson 90, other institutions 97) and departmental examinations (35). This total is almost double the 400 new freshmen who entered with advanced standing in 1978-79.

Performance in high school has proven to be the best single predictor of a student's success in his or her freshman year at Clemson. The class ranks of entering freshmen have improved to the point that 43 percent of the freshman class entering in the fall of 1979 ranked in the top 10 percent of their high school class; 68 percent in the top 20 percent; and 95 percent in the top 50 percent. Much publicity has been given to the decline in the past decade of SAT scores. In contrast, the average SAT of freshmen at Clemson has changed very little during the period of decline. In 1979 the freshman class boasted an average of 1002. The average reported by College Board for all high school seniors is 894. Clemson's is also the highest average among state-supported institutions in South Carolina.

Of the 5,437 new applications for admission processed for 1979-80, 3,830 were accepted and 2,572 actually enrolled.
freshmen and transfer students). South Carolina residents accounted for 77 percent of the 11,748 students, including those enrolled in off-campus programs. Clemson students come from all 46 South Carolina counties, 44 states, Puerto Rico, the District of Columbia, Virgin Islands, Guam and 44 foreign countries (198 students).

Greenville County continued to be the top contributor of students with 1,272 county residents enrolled. Pickens County was second with 912 students enrolled, followed in order by Anderson, Charleston and Oconee counties. Most out-of-state students come from North Carolina (429), Georgia (382) and Florida (317).

Computerized pre-registration helped the record number of students get off to a smooth start for fall classes. More than 90 percent were preregistered and had their course schedules completed before they arrived on campus to begin classes.

Fall semester enrollment comparisons for recent years are shown below:

### Fall Semester Enrollment Comparisons

<table>
<thead>
<tr>
<th>Year</th>
<th>Undergraduate</th>
<th>Graduate and Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970-71</td>
<td>6,679</td>
<td>1,359</td>
<td>8,038</td>
</tr>
<tr>
<td>1971-72</td>
<td>7,300</td>
<td>1,590</td>
<td>8,890</td>
</tr>
<tr>
<td>1972-73</td>
<td>7,686</td>
<td>2,071</td>
<td>9,757</td>
</tr>
<tr>
<td>1973-74</td>
<td>7,910</td>
<td>2,202</td>
<td>10,112</td>
</tr>
<tr>
<td>1974-75</td>
<td>8,171</td>
<td>2,415</td>
<td>10,586</td>
</tr>
<tr>
<td>1975-76</td>
<td>8,576</td>
<td>2,785</td>
<td>11,361</td>
</tr>
<tr>
<td>1976-77</td>
<td>8,620</td>
<td>2,763</td>
<td>11,383</td>
</tr>
<tr>
<td>1977-78</td>
<td>8,708</td>
<td>2,566</td>
<td>11,274</td>
</tr>
<tr>
<td>1978-79</td>
<td>8,925</td>
<td>2,553</td>
<td>11,478</td>
</tr>
<tr>
<td>1979-80</td>
<td>9,291</td>
<td>2,457</td>
<td>11,748</td>
</tr>
</tbody>
</table>

The 1979-80 figures include 741 students attending off-campus institutes and 190 in the Clemson-Furman University Master of Business Administration degree program.

Enrollment of women at Clemson reached an all-time high during the 1979 fall semester. There were 4,865 of which 3,602 were undergraduates on the campus. Enrollment of undergraduate coeds increased about 6 percent over last year. Women students now constitute more than 39 percent on-campus enrollment and about 41 percent of total enrollment.

The Clemson student body continues to be a working group which receives a significant amount of financial assistance in the
form of loans, grants, scholarships and work assistance. In 1979-80 approximately 3,655 students earned an estimated $3,731,575 working for the University. This figure does not include earnings from off-campus employment. Clemson awarded 317 long-term loans totaling $241,655 and approved and certified 884 guaranteed student loans from a variety of lending institutions. Excluding donor-selected scholarships, 531 scholarships and grants valued at $357,883 were awarded. The number of students receiving Basic Grants was 1,838 with awards totaling $1,693,424. In all, it is estimated that 40 to 50 percent of the student body received financial assistance administered by Clemson.

Student organizations on the Clemson campus offer opportunities for personal development beyond the classroom experience. Members of organizations participate in organizational governance, program planning and policy development. They represent Clemson at various conventions and competitions throughout the nation. In 1979-80, the 216 organizations claimed a total membership of more than 12,000 students and initiated 16 projects for local and national charities.

Student Government continues to play an important role at the University. The student body president serves on the President's Cabinet and has been a member of the screening committees for the provost and the director of the library. Student Government expanded the campus shuttle bus service to operate from Sunday through Thursday nights with routes that cover the entire campus, including all student parking lots.

Media organizations play an important part in the education of Clemson students, providing an outlet for student opinion and an avenue for artistic creativity. WSBF continued efforts to increase power outage, and "The Tiger" was judged Best College Newspaper in South Carolina by the South Carolina Press Association—Collegiate Division and received All America honors for the second semester from the Associated Collegiate Press.

In other areas of student services, a tour guide program for prospective students and their families was developed. Members of Mortar Board, Student Alumni Council, Alpha Phi Omega, Gamma Sigma Sigma, Interfraternity Council and Panhellenic Council provided 193 tours for potential Clemson families.

Sororities continue to grow in size and popularity at Clemson. In March of this year, eighth national sorority, Kappa Delta, colonized with 95 pledges. Sororities have an average of 100 members, and
the campus total includes approximately 23 percent of the undergraduate women at Clemson.

The fraternity system continues to be composed of 14 chapters of national college fraternities, comprising approximately 15 percent of all undergraduate males. Housing limitations both on and off campus prevent expansion in the number of chapters; however, a committee is currently exploring the feasibility of a fraternity and/or sorority row. The grade point average for all fraternity men is above the average for all undergraduate men.

Parking and traffic records are maintained to coincide with the academic calendar, running from Aug. 15 to Aug. 15 each year. During the period Aug. 15, 1979, through May 9, 1980, 10,184 student parking decals were issued and $17,342 was deposited to the Miscellaneous Income Account (MIA). The Campus Security Office wrote 31,781 student parking tickets during the same period. The total amount of parking fines collected at the Traffic Office and deposited to the MIA was $40,039 while $76,529 was turned over to the accounting office for collections. The Student Traffic Review Board heard appeals for 1,735 students involving 2,174 parking tickets, or about seven percent of the tickets written.

In the area of returned checks, 1,602 student checks were returned to the Student Affairs and Traffic Office. In the form of administrative handling charges, $1,735 was collected and deposited to the MIA by the Traffic Office while $1,193 was turned over to the accounting office for collections. Approximately 90 percent of the $85,614.06 from returned checks was collected by the Student Life and Traffic Office.

Career Services, which is composed of Placement and Cooperative Education, continued to expand their services. The Placement Office coordinated the visits of 275 companies/agencies in the fall and 244 in the spring. They conducted 5,912 interviews, or 36 percent more than last year. Most employer interest is still in engineering, business, computer science or textiles, but all interested graduating seniors had the opportunity to talk to industry representatives about career opportunities.

Clemson’s Cooperative Education Program, begun in 1973, continued to grow in 1979-80, placing some 330 students in more than 450 career/academically-related work assignments with industry and governmental agencies. Co-op students earned more than $1,200,000 during 1979-1980, bringing the cumulative co-op earnings of Clemson students to well over $3 million since 1973.
In 1979-80, Clemson’s best sports year ever, the Tigers were recognized as having the third best overall program in the nation. No less than eight Clemson teams finished in the top 15 in the nation in their respective polls or NCAA-AIAW tournaments, and five of those teams were ranked or finished in no less than a tie for fifth in the nation. Clemson was the only school in the nation to have its football team go to a post-season bowl, its basketball team advance to a regional of the NCAA tournament, and its baseball team go to the College World Series.

The Tigers were especially successful in the spring when the golf, tennis and baseball teams all received bids to NCAA play. Clemson was the only school in the nation to have all three of those major spring sports receive team bids to the tournaments. The track team sent nine representatives to the NCAA track meet in Austin, Tex., a representation with numbers near a whole team effort. (There are no team bids to the NCAA track meet.)

At the conference level, the Tigers won four ACC titles, three during the spring. That gives Clemson nine ACC championships in seven different sports over the last two academic years. A total of 42 athletes were named either first-team All-ACC or won an ACC individual championship. Clemson boasted 17 All-America athletes last year, and not one of the University’s 19 men’s and women’s varsity teams had a losing season.

### Clemson Team Finishes

<table>
<thead>
<tr>
<th>Men’s Sports</th>
<th>Record</th>
<th>ACC Finish</th>
<th>National Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseball</td>
<td>38-21</td>
<td>First</td>
<td>Fourth</td>
</tr>
<tr>
<td>Basketball</td>
<td>23-9</td>
<td>Fourth</td>
<td>Final 8 of NCAA Tourn</td>
</tr>
<tr>
<td>Cross Country</td>
<td></td>
<td>Fourth</td>
<td>Tie for Fifth</td>
</tr>
<tr>
<td>Fencing</td>
<td>14-1</td>
<td>Second, Tie</td>
<td>Peach Bowl, ranked as high as 11th</td>
</tr>
<tr>
<td>Football</td>
<td>8-4</td>
<td>Second, Tie</td>
<td>Tie for 12th</td>
</tr>
<tr>
<td>Golf</td>
<td>2-0</td>
<td>Second</td>
<td>8 swimmers at Nationals</td>
</tr>
<tr>
<td>Soccer</td>
<td>12-2-1</td>
<td>First</td>
<td>Eighth in final poll</td>
</tr>
<tr>
<td>Swimming</td>
<td>8-2</td>
<td>Third</td>
<td>Tie for 30th</td>
</tr>
<tr>
<td>Tennis</td>
<td>32-5</td>
<td>First</td>
<td></td>
</tr>
<tr>
<td>Indoor Track</td>
<td></td>
<td>Second</td>
<td></td>
</tr>
<tr>
<td>Outdoor Track</td>
<td></td>
<td>First</td>
<td></td>
</tr>
<tr>
<td>Women’s Sports</td>
<td>Record</td>
<td>ACC Finish</td>
<td>National Finish</td>
</tr>
<tr>
<td>Basketball</td>
<td>24-12</td>
<td>Second, Tie</td>
<td>Ranked as high as 16, made women’s NIT</td>
</tr>
<tr>
<td>Cross Country</td>
<td></td>
<td>Fifth</td>
<td></td>
</tr>
<tr>
<td>Fencing</td>
<td>7-7</td>
<td></td>
<td>Advanced to Regionals</td>
</tr>
<tr>
<td>Field Hockey</td>
<td>14-2</td>
<td>Third</td>
<td>9 swimmers at Nationals</td>
</tr>
<tr>
<td>Swimming</td>
<td>5-3</td>
<td>Second</td>
<td>Final 8 AIAW Nationals</td>
</tr>
<tr>
<td>Tennis</td>
<td>24-5</td>
<td></td>
<td>Advanced to Regionals</td>
</tr>
<tr>
<td>Volleyball</td>
<td>43-13</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Fall Semester 1979 Enrollment by Colleges, and Degrees Awarded
### December 1978 - August 1979

<table>
<thead>
<tr>
<th>Main Campus</th>
<th>Enrollment Fall Semester</th>
<th>Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Associate</td>
<td>Bachelor's</td>
</tr>
<tr>
<td>Agricultural Sciences</td>
<td>1,006</td>
<td>191</td>
</tr>
<tr>
<td>Architecture</td>
<td>428</td>
<td>87</td>
</tr>
<tr>
<td>Education</td>
<td>1,488</td>
<td>253</td>
</tr>
<tr>
<td>Engineering</td>
<td>2,453</td>
<td>285</td>
</tr>
<tr>
<td>Forest and Rec. Resources</td>
<td>581</td>
<td>135</td>
</tr>
<tr>
<td>Ind. Mgt. and Text. Science</td>
<td>2,324</td>
<td>355</td>
</tr>
<tr>
<td>Liberal Arts</td>
<td>825</td>
<td>213</td>
</tr>
<tr>
<td>Nursing</td>
<td>421</td>
<td>36</td>
</tr>
<tr>
<td>Sciences</td>
<td>1,214</td>
<td>169</td>
</tr>
<tr>
<td>Non-degree</td>
<td>77</td>
<td>...</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>10,817</strong></td>
<td><strong>1,757</strong></td>
</tr>
</tbody>
</table>

Degrees awarded since 1896 (through August 1979) total 42,277 of which 350 have been associate degrees; 34,670 bachelor's degrees; 6,657 master's degrees; 61 education specialist degrees; and 539 doctorates.
### Acceptance Rate of Applicants

<table>
<thead>
<tr>
<th>Year</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>87%</td>
</tr>
<tr>
<td>1971</td>
<td>87%</td>
</tr>
<tr>
<td>1972</td>
<td>83%</td>
</tr>
<tr>
<td>1973</td>
<td>83%</td>
</tr>
<tr>
<td>1974</td>
<td>84%</td>
</tr>
<tr>
<td>1975</td>
<td>77%</td>
</tr>
<tr>
<td>1976</td>
<td>69%</td>
</tr>
<tr>
<td>1977</td>
<td>69%</td>
</tr>
<tr>
<td>1978</td>
<td>69%</td>
</tr>
<tr>
<td>1979</td>
<td>70%</td>
</tr>
</tbody>
</table>

### Retention Rate of Students (Freshman Class)

<table>
<thead>
<tr>
<th>Year</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>82%</td>
</tr>
<tr>
<td>1970</td>
<td>78%</td>
</tr>
<tr>
<td>1971</td>
<td>84%</td>
</tr>
<tr>
<td>1972</td>
<td>82%</td>
</tr>
<tr>
<td>1974</td>
<td>83%</td>
</tr>
<tr>
<td>1975</td>
<td>83%</td>
</tr>
<tr>
<td>1976</td>
<td>83%</td>
</tr>
<tr>
<td>1977</td>
<td>84%</td>
</tr>
<tr>
<td>1978</td>
<td>87%</td>
</tr>
</tbody>
</table>

### Number and Percent of Black Students

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>121</td>
<td>2</td>
</tr>
<tr>
<td>1971</td>
<td>134</td>
<td>2</td>
</tr>
<tr>
<td>1972</td>
<td>179</td>
<td>2</td>
</tr>
<tr>
<td>1973</td>
<td>211</td>
<td>2</td>
</tr>
<tr>
<td>1974</td>
<td>216</td>
<td>2</td>
</tr>
<tr>
<td>1975</td>
<td>338</td>
<td>3</td>
</tr>
<tr>
<td>1976</td>
<td>307</td>
<td>3</td>
</tr>
<tr>
<td>1977</td>
<td>336</td>
<td>3</td>
</tr>
<tr>
<td>1978</td>
<td>290</td>
<td>3</td>
</tr>
<tr>
<td>1979</td>
<td>341</td>
<td>3</td>
</tr>
</tbody>
</table>
### Student-Faculty Ratio (Full-Time Equivalent)

<table>
<thead>
<tr>
<th>Year</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>13.1 : 1</td>
</tr>
<tr>
<td>1971</td>
<td>14.6 : 1</td>
</tr>
<tr>
<td>1972</td>
<td>14.6 : 1</td>
</tr>
<tr>
<td>1973</td>
<td>16.8 : 1</td>
</tr>
<tr>
<td>1974</td>
<td>17.9 : 1</td>
</tr>
<tr>
<td>1975</td>
<td>18.3 : 1</td>
</tr>
<tr>
<td>1976</td>
<td>17.6 : 1</td>
</tr>
<tr>
<td>1977</td>
<td>16.3 : 1</td>
</tr>
<tr>
<td>1978</td>
<td>15.9 : 1</td>
</tr>
<tr>
<td>1979</td>
<td>16.0 : 1</td>
</tr>
</tbody>
</table>

### Average College Board Score of Freshmen

<table>
<thead>
<tr>
<th>Year</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>1005</td>
</tr>
<tr>
<td>1971</td>
<td>997</td>
</tr>
<tr>
<td>1972</td>
<td>995</td>
</tr>
<tr>
<td>1973</td>
<td>982</td>
</tr>
<tr>
<td>1974</td>
<td>984</td>
</tr>
<tr>
<td>1975</td>
<td>983</td>
</tr>
<tr>
<td>1976</td>
<td>996</td>
</tr>
<tr>
<td>1977</td>
<td>985</td>
</tr>
<tr>
<td>1978</td>
<td>1000</td>
</tr>
<tr>
<td>1979</td>
<td>1002</td>
</tr>
</tbody>
</table>

### Number of Teachers (Full-Time Equivalent Teaching Faculty)

<table>
<thead>
<tr>
<th>Year</th>
<th>Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>571.2</td>
</tr>
<tr>
<td>1971</td>
<td>580.1</td>
</tr>
<tr>
<td>1972</td>
<td>614.8</td>
</tr>
<tr>
<td>1973</td>
<td>578.4</td>
</tr>
<tr>
<td>1974</td>
<td>591.8</td>
</tr>
<tr>
<td>1975</td>
<td>602.5</td>
</tr>
<tr>
<td>1976</td>
<td>611.3</td>
</tr>
<tr>
<td>1977</td>
<td>654.4</td>
</tr>
<tr>
<td>1978</td>
<td>675.6</td>
</tr>
<tr>
<td>1979</td>
<td>691.8</td>
</tr>
</tbody>
</table>
## Number in Freshman Class
(New Students)

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>1,774</td>
</tr>
<tr>
<td>1971</td>
<td>1,853</td>
</tr>
<tr>
<td>1972</td>
<td>1,919</td>
</tr>
<tr>
<td>1973</td>
<td>2,034</td>
</tr>
<tr>
<td>1974</td>
<td>1,949</td>
</tr>
<tr>
<td>1975</td>
<td>1,901</td>
</tr>
<tr>
<td>1976</td>
<td>1,861</td>
</tr>
<tr>
<td>1977</td>
<td>1,838</td>
</tr>
<tr>
<td>1978</td>
<td>2,020</td>
</tr>
<tr>
<td>1979</td>
<td>1,998</td>
</tr>
</tbody>
</table>

## Number of On-Campus Students in Summer School

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>4,428</td>
</tr>
<tr>
<td>1971</td>
<td>4,692</td>
</tr>
<tr>
<td>1972</td>
<td>5,232</td>
</tr>
<tr>
<td>1973</td>
<td>6,267</td>
</tr>
<tr>
<td>1974</td>
<td>5,997</td>
</tr>
<tr>
<td>1975</td>
<td>6,275</td>
</tr>
<tr>
<td>1976</td>
<td>6,100</td>
</tr>
<tr>
<td>1977</td>
<td>6,301</td>
</tr>
<tr>
<td>1978</td>
<td>6,396</td>
</tr>
<tr>
<td>1979</td>
<td>6,708</td>
</tr>
<tr>
<td>Year</td>
<td>Beds</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
</tr>
<tr>
<td>1960</td>
<td>2,900</td>
</tr>
<tr>
<td>1965</td>
<td>3,624</td>
</tr>
<tr>
<td>1966</td>
<td>3,920</td>
</tr>
<tr>
<td>1967</td>
<td>4,348</td>
</tr>
<tr>
<td>1968</td>
<td>4,780</td>
</tr>
<tr>
<td>1969</td>
<td>4,764</td>
</tr>
<tr>
<td>1970</td>
<td>5,190</td>
</tr>
<tr>
<td>1971</td>
<td>5,174</td>
</tr>
<tr>
<td>1972</td>
<td>5,174</td>
</tr>
<tr>
<td>1973</td>
<td>5,330</td>
</tr>
<tr>
<td>1974</td>
<td>5,592&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>1975</td>
<td>5,616&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>1976</td>
<td>5,625&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>1977</td>
<td>5,662&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>1978</td>
<td>5,933&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>1979</td>
<td>6,056&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td>1980</td>
<td>6,543&lt;sup&gt;g&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> Includes 252 beds in the Clemson House.
<sup>b</sup> Includes 262 beds in the Clemson House.
<sup>c</sup> Includes 271 beds in the Clemson House.
<sup>d</sup> Includes 308 beds in the Clemson House.
<sup>e</sup> Includes 312 beds in the Clemson House.
<sup>f</sup> Includes 324 beds in the Clemson House.
<sup>g</sup> Includes 329 beds in the Clemson House.
<sup>+</sup> 366 beds are temporary housing.
<sup>++</sup> 812 beds are in overflow housing areas.
## CURRENT OPERATING FUNDS

### Revenues and Additions by Source

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Fees</td>
<td>$9,683,145</td>
<td>8.66%</td>
</tr>
<tr>
<td>State Appropriations:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational and General</td>
<td>38,599,059</td>
<td>34.51%</td>
</tr>
<tr>
<td>Agricultural Research and Public Service</td>
<td>21,428,296</td>
<td>19.16%</td>
</tr>
<tr>
<td>Federal Appropriations:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational and General (Morrill-Nelson)</td>
<td>121,373</td>
<td>.11%</td>
</tr>
<tr>
<td>Agricultural Research and Public Service</td>
<td>8,814,921</td>
<td>7.88%</td>
</tr>
<tr>
<td>Sales and Services of Educational Departments</td>
<td>1,662,753</td>
<td>1.49%</td>
</tr>
<tr>
<td>Miscellaneous Sources</td>
<td>3,820,807</td>
<td>3.42%</td>
</tr>
<tr>
<td>Endowment Income</td>
<td>122,782</td>
<td>.11%</td>
</tr>
<tr>
<td>Sales and Services of Auxiliary Enterprises</td>
<td>16,900,282</td>
<td>15.13%</td>
</tr>
<tr>
<td>Federal Grants and Contracts</td>
<td>4,597,316</td>
<td>4.11%</td>
</tr>
<tr>
<td>State Grants and Contracts</td>
<td>1,366,226</td>
<td>1.22%</td>
</tr>
<tr>
<td>Local Grants and Contracts</td>
<td>61,772</td>
<td>.06%</td>
</tr>
<tr>
<td>Private Gifts, Grants and Contracts</td>
<td>4,652,763</td>
<td>4.16%</td>
</tr>
<tr>
<td><strong>TOTAL REVENUES AND ADDITIONS</strong></td>
<td>$111,831,500</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

Brought forward from 1978-79 for:

- Encumbrances and Restricted Funds Balance: $3,171,630

**TOTAL FUNDS AVAILABLE**: $115,003,130

### Expenditures by Function

<table>
<thead>
<tr>
<th>Function</th>
<th>Amount</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction</td>
<td>$23,343,015</td>
<td>21.45%</td>
</tr>
<tr>
<td>Research—Departmental</td>
<td>5,814,229</td>
<td>5.34%</td>
</tr>
<tr>
<td>Research—Agricultural Experiment Station</td>
<td>11,677,422</td>
<td>10.73%</td>
</tr>
<tr>
<td>Extension and Public Service</td>
<td>3,854,837</td>
<td>3.08%</td>
</tr>
<tr>
<td>Extension and Public Service—Cooperative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural Extension Service</td>
<td>15,767,807</td>
<td>14.49%</td>
</tr>
<tr>
<td>Extension and Public Service—Regulatory Service</td>
<td>3,416,279</td>
<td>3.14%</td>
</tr>
<tr>
<td>Academic Support</td>
<td>5,772,373</td>
<td>5.30%</td>
</tr>
<tr>
<td>Student Services</td>
<td>3,163,654</td>
<td>2.91%</td>
</tr>
<tr>
<td>Institutional Support</td>
<td>6,937,807</td>
<td>6.37%</td>
</tr>
<tr>
<td>Operation and Maintenance of Plant</td>
<td>7,841,827</td>
<td>7.20%</td>
</tr>
<tr>
<td>Auxiliary Enterprises</td>
<td>15,482,611</td>
<td>14.22%</td>
</tr>
<tr>
<td>Scholarships and Fellowships</td>
<td>1,315,049</td>
<td>1.21%</td>
</tr>
<tr>
<td>Departmental Administration</td>
<td>4,966,161</td>
<td>4.56%</td>
</tr>
<tr>
<td><strong>TOTAL EXPENDITURES</strong></td>
<td>$108,853,071</td>
<td>100.00%</td>
</tr>
</tbody>
</table>

Transfers and Other Deductions: $5,908,191

**TOTAL EXPENDITURES, TRANSFERS AND OTHER DEDUCTIONS**: $114,761,262

Balance 6/30/80 for Encumbrances and Restricted Funds Balance: $241,868

**TOTAL EXPENDITURES & BALANCE**: $115,003,130

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## Scholarship and Student Aid and Loan Funds

### Fiscal Year 1980

#### Revenue

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest on Loans</td>
<td>$15,671.09</td>
</tr>
<tr>
<td>Gifts, Grants and Contracts</td>
<td>$2,683,707.05</td>
</tr>
<tr>
<td>Endowment Income</td>
<td>$136,797.04</td>
</tr>
<tr>
<td>Investment Income</td>
<td>$404,059.91</td>
</tr>
<tr>
<td>Other Income</td>
<td>$29,453.05</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$3,269,688.14</strong></td>
</tr>
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#### Disbursements

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational Loans</td>
<td>$260,492.00</td>
</tr>
<tr>
<td>Grants for Scholarships and Fellowships (Including Grants-in-Aid)</td>
<td>$2,660,851.15</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$2,921,343.15</strong></td>
</tr>
</tbody>
</table>
PUBLIC SERVICE PROGRAMS OF THE COLLEGE OF AGRICULTURAL SCIENCES

L. P. Anderson, Dean

The College of Agricultural Sciences administers statewide public service programs in addition to its programs for Resident Instruction. Among its public service functions are administration and coordination of the varied activities and services of the South Carolina Agricultural Experiment Station, the Cooperative Extension Service, the Division of Regulatory and Public Service Programs, and the Livestock-Poultry Health Department. Reports for these divisions follow.

SOUTH CAROLINA AGRICULTURAL EXPERIMENT STATION

W. Cecil Godley, Director

South Carolina's only program of State-funded agricultural research is conducted by Clemson's S. C. Agricultural Experiment Station.

Scientists in 10 departments in the College of Agricultural Sciences provide the expertise for the program. Additional research in home economics is conducted by faculty at Winthrop College.

Facilities at Clemson University and at four branch stations located over the State provide indoor and outdoor laboratories for researchers in the fields of agricultural economics, agricultural engineering, agronomy, animal science, dairy science, entomology and economic zoology, food science, horticulture, plant pathology and poultry science.

The four branches of the Experiment Station enable researchers to conduct studies that relate to the problems experienced by growers in their areas under the same constraints of soils and climate.

The Experiment Station was established in 1886 under federal laws and operates under State control with annual appropriations from the South Carolina Legislature supplemented by appropriations from the U. S. Congress.

Experiment Stations operate in all 50 states and conduct both cooperative and complementary research, seeking to avoid duplication of effort and to increase the vast pool of agricultural information that has been largely responsible for the tremendous advances of the past half-century.
To meet the future challenge, S. C. Experiment Station researchers will continue to add their research findings to those of fellow researchers in other states who are working for a common goal—providing better standards of living for people through the best possible use of natural resources.

**Highlights and Accomplishments**

The following summary is, at best, a skimming of the surface of the extensive research program of the Experiment Station. A few representative projects have been chosen from some 220 active research projects under way in 1979-1980. Many significant ones have not been mentioned, but the ones selected may give the reader an idea of the scope of the total program of the Station.

**Agricultural Economics and Rural Sociology**

Economists and sociologists are looking for better ways to understand, develop and use South Carolina’s natural resources.

Considerable research was completed during the past year concerning the people of the State. Research profiling South Carolina’s agricultural and home economics students indicates these students are very similar. As a whole, both groups are characterized by ambitious, intelligent and highly motivated young men and women. Another study estimated the economic growth and the demand for college graduates in South Carolina. It concluded that demand for baccalaureate graduates is highly sensitive to rates and mix of economic growth in the State. There does not seem to be a pressing economic need to expand enrollment in the public colleges and universities in South Carolina.

Continued emphasis was placed on regional development research. An index to measure the quality of various industrial alternative developments was constructed. It can be applied to an environmentally important area to illustrate the trade-offs between economic and environmental considerations which might result. This index to assess priorities in industrial location decisions had several weaknesses, but it illustrated the usefulness of such a broad-based quality of life measure.

Research exploring the economic-demographic impact of the nuclear energy center was conducted. A scenario for a series of 12 nuclear plants in a single location was examined for environmental and socio-economic impact. The report indicated a rather large effect on population, employment and income of the 12-county Anderson region. The direct impact outweighed the indirect for the first 10-18 years.
Research on planning for drought in the United States indicated that only a few states have formal drought management plans. About half of the states have passed or proposed new water policy laws since 1970. South Carolina is subject to drought problems, and planning for drought contingencies is badly needed.

The Farmers Home Administration provides assistance to farmers with credit problems. A handbook was prepared to assist loan officers to make more consistent loan decisions. The handbook contained guidelines for loan analysis and investment analysis.

An economic study estimating potential supplies of ethanol oil feedstocks from major South Carolina farm commodities indicates that the feedstock base is relatively low in South Carolina. If a very large industry of ethanol production developed, the supply would need to come from expanded feedstocks in South Carolina or be imported from other states.

Research continued on the economics of peach production. Investment, planning and replacement decisions were considered, and guides were presented to help farmers make a better decision about replacing peaches or investing in peach orchards.

**Agricultural Engineering**

Agricultural engineers continued major efforts in the areas of energy, mechanization and computer applications during the past year.

Energy-related research includes the design and construction of an on-farm fuel alcohol still. The still will have flexibility for investigations of production and energy efficiencies using different carbohydrate feedstocks and renewable energy sources to provide process heat.

The effectiveness of using natural air to dry corn in South Carolina was estimated by combining historical weather data with a computer simulation of the grain drying process. On the average, natural air occurring in South Carolina will not dry corn to a moisture content low enough for safe long-term storage. Also, a solar supplemented heat-pump system was tested as a source of heat for drying corn and found to be energy efficient and to yield dry corn of satisfactory quality.

Rearing early weaned pigs in unheated kennels was compared to rearing pigs in a heated nursery. Energy was saved and gains were similar, but feed efficiency was decreased significantly.

An oyster harvester was field tested this year while transplanting 5,000 bushels of oysters from polluted waters to unpolluted waters.
for the South Carolina Marine Resources Department. Results of these initial tests show that the machine can harvest about 600 bushels per hour with damage equal to or less than that of hand harvesting. An environmental impact study will be started this year, along with development of a shrimp deheader.

A harvest aid designed to carry 12 workers for hand harvesting six rows of vegetables was designed. Construction of a prototype has been largely completed except for assembly of a central collecting conveyor. Workers deposit the product directly into elevating conveyors which discharge overhead in a central collecting conveyor. Initial testing of the prototype was conducted on staked tomatoes with promising results.

A computer instrumentation system was used to measure the energy required for operating a four-row subsoiler/bedder at three different depths. The soil profile was sampled to characterize the effects of tillage on soil bulk density and resistance to penetration. Yield data in an irrigation-tillage interaction study indicated that comparable yields could be obtained with any of the four tillage systems studied. While data have only been collected for two years, it appears that subsoiling may not be necessary where water will not be a limiting factor.

Peach production mechanization is being expanded to develop a totally mechanized system for the major orchard operations including harvesting, thinning and pruning. New orchard cultural systems especially adapted to machine operations will be studied.

The microcomputer-based automatic controller for a soybean combine has been installed and will be field tested in 1980. A variety-selection model for soybeans has been developed.

The animal waste management program has continued to emphasize the land application of wastes and measuring non-point source pollution from pastures. In addition, swine, dairy and poultry lagoons are being characterized to better understand the technology for land spreading of excess lagoon supernatant and sludge.

Agronomy and Soils

Research by agronomists and soil scientists primarily concerns practical and new ways producers can increase farm profits from crops through efficient management practices.

Each year research and demonstrations are conducted in the major production areas to collect data for advising growers on crop varieties that should be grown, fertilizer and chemicals that should be used, and herbicides that will control weeds.
Considerable effort is devoted to evaluation of herbicides and cultural practices in crop management systems for control of weeds in soybeans, cotton, corn and peanuts. New research concerns control of volunteer cowpeas in soybeans. Cowpeas are a major contaminant in producing certified soybean for seed.

Official variety testing is necessary to provide yield potential of the varieties of field crops that can be grown successfully and will out-perform currently used varieties in yield and/or quality. Crops evaluated are soybeans, tobacco, cotton, peanuts, grain sorghum, the small grains, alfalfa, perennial grasses and sunflowers. Sunflowers, a potential new crop, are being bred and studied for performance relating to date of planting, fertilization rates and as a second crop.

From the small grain breeding program, announcement will be made in 1980-81 of a new awnless barley variety that will be early and well suited for double cropping systems with soybeans or grain sorghums. Effort has also accelerated toward development of additional barley varieties that are resistant to the prevalent diseases in the Southeast.

Plant breeders have made progress in developing a late planted soybean. A suitable variety for late planting should be available to South Carolina growers within the next two years. Soybean lines with the ability to penetrate compacted soil in absence of subsoiling have been isolated. Effort will be made to develop varieties that have this capability and other desirable agronomic characteristics.

Corn hybrids are tested each year for performance under South Carolina conditions. Test has increased on varieties under high mosaic disease conditions.

Clemson PD 4, a new tobacco variety, has been approved for release. This variety will be available to growers as soon as seed supply becomes available. In addition to being comparable to other recommended tobacco varieties in quality and yield, Clemson PD 4 can be used in the single harvest (once-over) system.

Researchers have learned that producers can discard the three or four bottom leaves of flue-cured tobacco at early button stage and realize a profit in improved yields and quality.

Sulfur, major nutrient and micronutrient status of South Carolina soils is being surveyed for availability to crops through soil sampling and tissue sampling techniques. Other fertility research includes evaluation of foliar materials, relationship of acidity to root growth,
availability of micronutrients, and nutrient requirements for irrigated and non-irrigated crops.

**Animal Science**

Animal scientists work toward the goal of developing cost-effective practices for producing meat which the consumer will readily purchase.

Research continues in the areas of year-round grazing systems for cattle. These systems emphasize least-cost methods of producing beef with maximum use of grazed forages while maximizing use of the climate and topography of South Carolina for forage production. In the Piedmont, one year-round, double-cropping system which offers promise involves fall grazing of fescue clover, winter annual grazing (rye and crimson clover), spring grazing of fescue clover and summer grazing of millet which is double-cropped after the winter annual.

Rebreeding of young beef cows is a problem for many cattlemen. Reproductive physiologists found that young beef cows with calves, which normally show first heat about 90 days after calving, exhibited heat 25 days after calving with the aid of an estrogen implant. Young cows without calves and three-year-old cows with calves showed the first heat 55 and 65 days after calving, respectively. The combination of a hormone-like implant treatment and early calf removal resulted in pregnancy within 90 days after calving for young beef cows in most cases.

Also, trenbolone acetate, a synthetic male sex hormone, has been tested by ear implantation in feedlot heifers. Results indicate that use of this drug may improve rate and efficiency of gain without adverse effects on carcass quality.

Field trials have been conducted using a new compound, Regumate, which has been found to be effective in synchronizing estrous cycles of cycling swine. Gilts were assigned to one of three treatments of daily feeding of Regumate; 0 milligrams, 15 milligrams or 20 milligrams per head per day for 18 days. Seventy-nine percent and 68 percent of the 15-milligram and 20-milligram level gilts responded by returning to heat within seven to ten days following withdrawal, whereas 75 percent of the control gilts returned to heat in the 28-day period starting with the first day of feeding of Regumate and ending ten days after the last day of Regumate feeding. The results of these field trials, along with results from other states' studies, will be compiled and presented to the Food and Drug Administration in an attempt to gain approval for use of
Regumate for synchronization of estrus in swine as a routine practice.

Animal scientists developed a sampling system for following microbial load of beef rounds. Rounds were sampled at 0, 3 and 10 days after slaughter using a strip sample and a core sample just above the hitch bone. Samples were tested for aerobic mesophils, lactobacillus and clostridia. Bacterial numbers was small and very acceptable.

Dairy Science

Dairy scientists at Clemson are interested in all aspects of milk production and processing, researching subjects ranging from calf mortality to consumer acceptance of the finished product in the supermarket.

Calf mortality varies considerably from herd to herd and can represent a tremendous economic loss to the dairyman. Current trends in the United States dairy industry indicate that although there are fewer herds, herd size is increasing. Earlier studies have shown that as herd size increases, calf mortality increases. A survey form was distributed to South Carolina dairymen to relate heifer calf losses through six months of age with various management practices. Including heifer calves born dead or abnormal, 19 percent of all heifer calves died before six months of age. The most critical period of time in the life of a newborn calf is from birth to one month of age which accounted for 50 percent of total mortality.

The survey showed that as herd size increased, calf mortality decreased. In the study, the larger herds were judged to be the better managed, more productive herds as indicated by their higher rolling herd average for fat production. Other factors related to mortality were (1) person responsible for calf rearing, (2) assurance of adequate colostrum intake, (3) age at weaning and (4) general feeding practices. No attempt was made to determine additive effects by combining two or more practices. It is assumed that the more things done right, the greater the chance to reduce mortality. It is doubtful that any one practice is so powerful that it could overcome several poor practices. However, one poor practice may outweigh several good ones.

The shelf-life of milk and skim milk is dependent, in large measure, on its storage temperature. There seems to be a general feeling that skim milk does not have as good a shelf-life in commercial channels as does whole milk.
Based on five replications, skim milk averaged a satisfactory shelf-life of ten days at 40°F, five days at 45°F, and three days at 50°F, while whole milk averaged 14, six and four days, respectively. The storage temperature of the milk had a significant effect on the shelf-life of both skim milk and whole milk. Hence, maintaining a constant, low temperature is imperative for a good quality milk if it is to have a reasonable shelf-life.

A two-year survey was made of the University’s dairy herd where each sample of mastitic milk was cultured, and the mastitis pathogen isolated and cultured. The causative organism was then subjected to an antibiotic disc assay. The more widely used antibiotics—penicillin, streptomycin and erythromycin—were relatively ineffective, whereas tetracycline and cephalothin showed considerably more effectiveness. The incidence of mastitis was greatly increased during the summer months, with a lesser increase during the winter months.

Methods have been developed and modified for separation of the main protein fractions and the non-protein nitrogen fraction of forages and silage. Laboratory silos were constructed, and alfalfa at various dry matter contents was ensiled for up to 30 days. Numerous parameters will be assayed which ultimately will be used in determining their effects on soluble protein-non-protein nitrogen ratios and subsequent silage quality. Labeling of protein fractions with an azo-dye has been evaluated for eventual use in *in vitro* protein degradation studies.

Initial studies have begun on the effect of low-lactose milk on the ripening time and quality of blue cheese.

**Entomology and Economic Zoology**

Entomologists continue to look for new methods of controlling insects harmful to crops, animals and humans. Wildlife and fisheries biologists investigate ways to better produce or protect wildlife or aquatic life with economic importance (or potential importance) for South Carolina.

A new strain of bacteria is being tested as a biological control agent against mosquitoes. *Bacillus thuringiensis* has been on the market for several years for use against insect pests of tobacco, soybeans and cotton. The new strain, which was discovered in Israel to be effective against mosquito wiggles, is referred to as *B. thuringiensis* var. *israelensis*. Experiments are being conducted at Clemson against mosquitoes native to South Carolina to determine the best formulations to use, the most effective methods of applica-
tion, how the mosquitoes become infected, and the effect that the bacterium has on the environment.

It has been estimated that 13 percent of all United States agricultural production is lost to insect pests. Part of these losses is due to the reduction of natural enemies and insecticide resistance. Sole dependence upon pesticides is another contributing factor. Scientists in the Department of Entomology and Economic Zoology are currently placing research emphasis on insect pest management techniques (IPM) to combat these losses. IPM is based on field sampling, use of economic thresholds and the utilization of a combination of all available pest control practices, including pesticides. As new information is generated, actual field practice will be expanded, modified and tested for immediate implementation by South Carolina producers.

Destructive tobacco pests and their parasites and predators are being studied under field conditions in 11 tobacco producing counties as a cooperative effort between the Experiment Station, Cooperative Extension Service and farmer-cooperators. Data indicate there is a large number of beneficial arthropods present in tobacco in South Carolina. Two predators (lady beetles and spiders) were found in significant numbers. Three parasites were found to be significantly reducing the damage caused by tobacco budworms.

Clemson wildlife biologists are using radio-telemetry in a variety of ways to study ecologically and economically important South Carolina wildlife species. Bobcats, the largest native predator and a symbol of "wilderness" for many South Carolinians, are being monitored to determine the influence of sex, age and season on home range size, movement pattern and habitat preference. Additional studies are documenting the time and distance of subadult dispersal. Wood ducks, the most widely harvested waterfowl species in South Carolina, are being similarly studied to document home range size, movement pattern and habitat preference during the winter. Radio-transmitters placed on female feral hogs with litters enable researchers to closely approach family groups each day so that visual observations can be made to assess the magnitude and timing of piglet mortality.

Data derived from these studies will help wildlife managers accomplish specific management objectives.
Food Science

Food scientists study human nutrition and investigate new methods of processing and packaging foods for optimum value to the consumer.

Realizing that protein from different food sources, such as animal proteins, legume and cereal proteins, differ in their nutritional significance for humans, studies are under way to examine the basic structure of these proteins as well as to determine their contribution of essential and non-essential amino acids to meet dietary needs. Structural arrangement and protein associations with complex carbohydrates (gums, pectin, cellulose, hemicelluloses) and lignin may alter their enzymatic digestibility in the alimentary tract.

Improvement of digestibility occurs in all food materials during heating, such as home cooking from the raw state and commercially by thermal processing. However, in their final form for consumption, typical protein digestibilities still show that the classes of food proteins differ—for example, canned lima beans 81 percent, whole wheat bread and pork jowls 83 percent, beef sirloin 88 percent, and flounder 92 percent.

It is unknown what role dietary fiber components (the complex carbohydrates and lignin) may have in protein digestion. Since low and high protein digestibilities generally parallel low to high fiber contents in foods, current research will help establish relationships between fiber components, protein structure and protein enzymatic hydrolysis. The ultimate objective is to make the protein consumed in the diet more available for utilization by humans.

Loss of nutritional quality during packaging and storage of dehydrated foods has become important with the introduction of nutritional labeling. Studies were conducted to develop methods for predicting the shelf-life of dehydrated foods packaged in polymeric films. The specific index of shelf-life loss was the deterioration of vitamin C in dehydrated potatoes as a function of temperature, water activity and oxygen. Loss of ascorbic acid was found to occur in an oxygen free environment and to follow first-order reaction kinetics. Mathematical models were developed to predict the retention of ascorbic acid as a function of time, temperature and water activity.

The water transport property of packaging film and sorption characteristics of the food were also integrated into the model, and numerical solutions were obtained using a computer for various
simulated conditions. The validity of predicted loss of ascorbic acid was verified by actual packaging and storage tests. Good agreement was found between experimentally observed values and those predicted by the computer program.

Similar approaches to situations where nutrient deterioration occurs by more than one interacting mechanism is currently being evaluated. Such information would be invaluable in developing processing conditions to maximize nutrient retention of processed foods.

South Carolina has a higher incidence of cardiovascular disease and stroke than other states. To investigate this problem, a study has been initiated to ascertain risk factors, such as hypertension, that may be involved. Information about the incidence of adolescent hypertension would be valuable in devising intervention methods at an age when such methods might be most effective. Studies using 8-16 year olds were designed to determine relationships, if any, between age, sex, weight, race, taste acuity, physical activity, hair mineral levels and hypertension.

Results suggest that blood pressure increases with age, height, weight/height (an index of overweight conditions) and a preference for salty food. From a sample of 200 individuals (8-16 years old), males and blacks exhibited higher blood pressure than females and whites, respectively. Some relationship between types of foods consumed and increased blood pressure was suggested by the data. With 1,800 adolescent subjects (8-16 years old) hypertensive conditions were noted in eight to ten percent of the subjects from the Coastal Plains and in one to two percent of the subjects from the Piedmont. An increase in blood pressure was correlated with an increase in copper/zinc ratios of the hair in both blacks and whites. In whites, a greater Al/Zn ratio was correlated with increased blood pressure.

Of subjects with the greater incidence of hypertension (Coastal Plains), blood pressures increased with age in males, but not females, regardless of race. Taste acuity studies indicated race and sex differences for factors such as coffee intake, certain food preferences and weight/height ratios, but there was no difference based on blood pressures. Results of hair mineral analyses suggest a definite relationship between certain minerals and hypertension.

**Home Economics**

During 1979-80 research in the School of Consumer Science and Allied Professions at Winthrop College was conducted in the areas
of family and child development, home economics education, nutrition and textiles.

Data from one regional project, "Career Projections and Attainment of Low-Income Youth: Changes Over Time," had low return of mailed questionnaires. This is not unusual, however, since the project is a continuation of a longitudinal study begun in the 1960s. Of the 22 respondents, most of the 20-22-year-old black rural adults continue to live with parents in the community of origin. Most were employed and found jobs on their own or through relatives. They were not satisfied with their income but liked the job location and stability. They perceived average satisfaction with marriage. They indicated a desire to attend college; however, they expected that future education would be in the form of short courses.

In textiles, the effects of multiple layers of fabric were investigated. Data indicated that fabric thickness, weight and density are all factors affecting insulation ability. The development of an easy, inexpensive apparatus for measuring insulation value of fabrics was an outgrowth of this research.

Data from another project, "Effects of Home Laundering on the Durability of Fabrics for Men's Undershirts," revealed that weight loss and bursting strength were dependent on shrinkage and number of launderings. Sodium hypochlorite based bleach was more damaging than bleach containing sodium perborate.

In nutrition, one regional project, "Patterns of Food Intake and Nutritional Health of Girls," was completed. Five papers on various aspects of the project have been presented by the regional technical committee at scientific meetings. A three-year project was started to determine whether nutrition education given to teachers and food service supervisors affects plate waste of fourth and fifth grade students in public schools. Data for the first year indicate that less food is wasted in schools where nutrition education was provided.

In home economics education, a regional study of higher education in agriculture and home economics was completed. The purpose was to determine background characteristics and factors underlying the career choices of students enrolled in home economics as a major. Results indicated that black students were influenced in the selection of a home economics major by individuals other than their parents more than white students. However, mothers were the most important influential person for both groups on choice of major. For the black students, prior home economics experiences, high school courses and participation in FHA were deemed more
influential in their choice of home economics than they were for white students.

Horticulture

Horticulturists continue a broad range of research on vegetables, fruits, ornamental plants, turfgrasses and post-harvest handling.

The Variety Trial Garden, relocated on a three-acre plot in the Horticultural Gardens two years ago, was expanded this year to include two shade (saran-covered) beds and one full-sun bed. Just over 300 varieties are planted in the trial garden with more than 10,000 mums planted around the perimeters of all beds. In addition to variety evaluations, tests on the effects of various greenhouse treatments (i.e., fertilization and chemical growth regulators) on subsequent plant performance in the field were conducted with fibrous-rooted begonia (*Begonia x semperflorens-cultorum* 'Derby'), petunia (*Petunia hybrida* 'Comanche') and marigold (*Tagetes erecta* 'Bolero').

Research on southern pea breeding has led to the release of "Hercules" variety in 1980. A new program has been initiated in cooperation with Plant Pathology to evaluate all of the currently popular varieties of southern peas for resistance to mosaic. This is a very disastrous disease on southern peas which has become prevalent in South Carolina during the past five years. Our long-term approach is to develop varieties with resistance to this disease.

Breeding effort with pole beans has the objective of developing root rot resistant varieties of a horticulturally acceptable type. "Footlong" pole bean has now been released by the South Carolina Agricultural Experiment Station.

Four cucumber varieties with wide range disease resistance were released and named "Marketsett," "Poinmarket," "Slice" and "Pick." Pick is a pickling type while the others are slicers. Marketsett, Poinmarket and Slice offer potential in areas where the Marketmore series and Poinsett series are grown. These releases may be useful as varieties, as parents of hybrids and as pollinators in gynoecious hybrid blends.

"Carolina" collard and turnips, "Charlestowne" and "Roots," are now catalogued, indicating that seed are commercially available. Resistant to one or more races of downy mildew, Carolina collard is compact and comparable to Vates in color, plant type, wind and cold resistance. Charlestowne and Roots turnips are resistant to the turnip aphid. Both varieties have upright plant growth and non-pubescent foliage.
Watermelon producers have a few more years to wait for Clemson horticulturists to develop the ideal watermelon—blocky in shape to please shippers, about 20 pounds to please the consumer, high in sugar to please the tastebuds and early to market to please the grower.

Through a USDA grant, Clemson horticulturists hope to isolate the genetic factors responsible for race 2 anthracnose resistance in primitive melons so that the factors can be bred into commercial melons.

"Yates," "Ben Davis" and "Arkansas Black" apples were found to be suitable pollenizers for "Delicious." A crabapple, *Malus zumi calocarpa*, was also found to be suitable. Trees of this crabapple have been propagated and planted in commercial orchards for more extensive testing.

Sprays of CGA-15281 and GAF-7767-141 were effective for thinning peaches in the Sandhill and Piedmont sections of South Carolina. Higher rates of the latter material were used to de-fruit young peach trees, thus allowing tree structure to develop for future crops.

**Plant Pathology and Physiology**

Plant pathologists help growers control plant diseases and solve other crop production problems.

Blue mold of tobacco was a serious problem in 1979. Using research data from the Pee Dee Experiment Station, clearance for two fungicides for use against the blue mold fungus was obtained by the 1980 season. Results of research by nematologists were used to obtain a short-time clearance for ethylene dibromide for use against the Columbia lance nematode on soybeans.

Mixtures of nematodes on any crop present a problem for those providing recommendations. Data from research last year have helped delineate this question. It is now known that certain spiral nematodes make the root-knot nematode more damaging. The Columbia lance nematode will overpower root-knot nematodes and take over a field. Knowing this will assist in developing more precise control measures.

One goal of plant pathology research has been to reduce the amount of fungicides for control of fruit and nut diseases. For peach scab control during dry weather, it was found that one late-season spray of sulfur or two sprays of captan or chlorothalophosphamid can be omitted. When rainfall is frequent and plentiful, one
late-season spray of captan or sulfur or two of benomyl can also be omitted. The calyx-split spray can be omitted when captan is used. Major changes in pecan pest management can be made with certain fungicides. Downy spot control was better with six sprays with the experimental fungicide CTA 64251 than ten sprays over the full season with fungicides now used.

Peach fruits tinned after pit-hardening can succumb to brown-rot of peach and serve as a source of inoculum on mature fruit. It is probable that infected plums serve as a major source of primary inoculum for the brown-rot organism of peach. This information will be incorporated into control recommendations for peach diseases.

**Poultry Science**

Poultry scientists have continued to investigate a wide range of problems which beset producers and processors of poultry.

Turkey processors have observed a marked reduction in yield of cooked turkey meat in summer as compared to winter grown birds. Efforts by researchers have shown that this condition can be duplicated under experimental conditions. Growing birds in a cool environmental chamber as opposed to a warm environmental chamber resulted in higher yields of cooked meat with identical processing methods. Biochemical tests of freshly slaughtered turkeys showed that muscle from turkeys grown under cool conditions became acid much more slowly than those grown under hot conditions. This less acid condition is apparently related to better retention of juices and, therefore, to better yields. Further research may point the way to other methods of retaining these juices, but for the present, keeping growing turkeys as cool as possible is the only known solution.

The hot summers of the Southeast cause mortality among broilers each year, and experiments have been conducted here to study methods of reducing these deaths. The feeding of new, aspirin-like drugs has greatly reduced death losses from high temperatures. Unfortunately, these materials are not cleared for commercial use pending extensive testing for safety.

It is not economically feasible to provide air conditioning for broiler houses, and evaporative cooling has limited effectiveness. The possibility of providing medication capable of allowing birds to withstand excessive summer heat is therefore an exciting one.

Research on the preservation of chicken and turkey semen has been a frustrating experience for investigators for many years.
Techniques that work for preservation of semen from bulls and male humans have been miserable failures when applied to semen from birds. Nevertheless, work continues because preservation for even 24 hours would be highly beneficial, especially to the turkey industry, where artificial insemination is the rule. Recent Clemson research has concentrated on preserving semen without freezing. Some evidence suggests that oxygen toxicity may be responsible for the poor fertility observed with stored semen, and this theory is being investigated in depth. If these experiments are successful, the already efficient poultry meat industry will become even more effective in providing economical and tasty products for the nation's consumers.

Branch Stations

The four branch stations of the S. C. Agricultural Experiment Station continued this year to emphasize the specialties of the areas in which they are located.

Fruit and nut tree research, along with vegetable investigations, are conducted at the Sandhill Station at Pontiac. The S. C. Swine Evaluation Center and Livestock-Poultry Health Division also are located at Sandhill.

The Pee Dee Station at Florence continued to expand crop research on tobacco, soybeans and corn on the site of the soon-to-be-constructed Pee Dee Research and Education Center for Agriculture, which will take the place of the present station in coming years.

The Coastal Station at Charleston supplies information to the Extension Service for its work with vegetable growers in the Coastal Plain. Ornamental research is also conducted at the Coastal Station, and a large Urban Research and Demonstration Area along Highway 7 South is maintained to provide information to school classes, garden clubs and homeowners concerning flowers, herbs, shade trees, lawn grasses and other growing plants, as well as vegetables.

The Edisto Station at Blackville gears its research to the needs of growers and cattle producers in the Upper Coastal Plain. Field crops such as soybeans, corn, small grains, melons and sweet potatoes get attention there, and projects with beef cattle are conducted.
Active Research Projects, 1979-80

Agricultural Economics and Rural Sociology
Marketing Performance of Selected Milk Pricing Systems for the Southern Region.
Economics of Peach Production in S. C.
Efficiency of Identification, Assembly and Transportation of Cotton to Mills and Export Outlets.
Comprehensive Econometric Model of the U. S. Tobacco Industry.
Social Organization for Development of Low-Income Rural Counties.
Organization and Efficiency of the Fruit and Vegetable Production Marketing Subsector in the South.
Impacts of Technical and Economic Changes on S. C. Farms.
Impact of Selected Institutional Factors on S. C. Agriculture.
Local Fiscal Impact of Economic-Demographic Change in S. C.
Price Discovery and Informational Flows for Major Agricultural Commodities in the Southern Region.
Social and Economic Impact of Adopting Mechanical Tobacco Harvester in S. C.
Structures and Adjustments of S. C. Agricultural Sector.
Local Factors Affecting Industrial Plant Locations in S. C. Communities.
Optimum Number, Size and Location of Commercial Grain Storage in S. C.
Economics of Row Crop Irrigation in S. C.
Changing Structure of Agriculture: Causes, Consequences and Policy Implications.
Accommodations Tax and Property Tax Relief in Selected Agricultural Counties of S. C.
Employment Impact of Foreign Trade in S. C. and the South.
Providing Basic Agricultural Marketing Information for Program and Facility Planning.

Agricultural Engineering
Soil and Environmental Factors Affecting Longevity and Productivity of Peach Trees.
Soybean Production and Management Simulation Models.
Development of Hydrologic/Water Quality Models for Agriculture and Forestry.
Storage of Baled Coastal Bermudagrass Hay.
Automatic Controller to Improve Harvest Efficiency and Reduce Soybean Damage.
Checklist and Training Guidelines for Agricultural Workers' Safety.
Non-Point Source Pollution from Grassed and Forested Lands in the Piedmont of S. C.
Mechanized Sorting of Peaches.
Bulk Handling Systems for Machine Harvested Tree Fruit Crops.
Cultural Practices and Energy Relationships for Irrigated Production in S. C.
Utilizing Anaerobic Livestock and Poultry Lagoon Sludge.
Potential for Ambient Air Grain Drying in S. C.
Housing for Low- and Moderate-Income Families.
Utilizing Swine Lagoon Effluent on Forest Land.
Flue-Cured Tobacco Bulk Curing Technology.
Water Conservation and Improved Waste-Water Treatment in Individual Rural Housing.
Trickle Irrigation in Humid Regions.
Computers in Agriculture.
Animal Waste Utilization and Treatment Systems.
Viability of Soybeans in Storage.
Energy Reduction for On-Farm Processing of Agricultural Products.
Optimize Efficiency of Energy Utilization in Agricultural Housing Systems.
Ethanol Production and Energy Efficiencies for On-Farm Fuel Production.

Agronomy and Soils
Sulfur Supply of Air, Rainwater and Soil as Related to Agronomic and Horticultural Crop Needs.
Adaption and Breeding of a Cool-Season Forage Grass Species.
Heat-Drought Tolerance in Trifolium Spp. and Soybeans.
Cytogenetics Studies of White Clover and Related Species.
Tobacco Production.
Tobacco Breeding and Genetics.
Diagnosis and Correction of Boron and Manganese Problems in Crop Production.
Development of Weed Control Practices in Corn, Cotton and Soybeans.
Minimum Tillage and Double Cropping on Weed Populations and Persistence and Fate of Herbicides.
Diagnosis and Correction of Manganese and Molybdenum Problems in Legumes.
Enhancing Biological Dinitrogen Fixation in Soybeans and Other Legumes.
Chemical, Physical and Mineralogical Properties of Selected Soils of S. C.
Cotton Breeding.
Selection of Tall Fescue and Hardinggrass for Persistence in Coastal Bermudagrass in the Piedmont.
Primary Root Development in Soybeans on Compacted Coastal Plains Soils.
Development of Soybean Varieties Adapted to S. C.
Movement and Retention of Water and Solutes in Selected Southern Regional Field Soils.
Corn Breeding.
Rhizosphere Ecology as Related to Plant Health and Vigor.
Rate of Soybean Root Growth and Nutrient Uptake as a Function of Varieties, Soil Properties and Additives.
Chemical Changes in Atmospheric Deposition and Effects on Land and Surface Waters.
Cultural Practices and Varieties for Sunflower Production.
Soil Properties and Nutrient Levels in Relation to Nutrient Uptake by Corn and Soybeans.
Sunflower Improvement.
Significance and Distribution of Mineral Components in Southern Soils.
Small Grain Breeding.
Evaluation of Selected Varieties and Advanced Experimental Strains of Cotton.
Evaluation of Corn Hybrids and Advanced Breeding Lines.
Evaluation of Selected Varieties and Advanced Experimental Strains of Soybeans.
Evaluation of Varieties and Experimental Strains of Wheat, Oats, Barley and Rye.
Evaluation of Selected Grain Sorghum Hybrids.

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Animal Science
Genotypic and Phenotypic Response of Crossbred Cattle Under Different Levels of Management.
Productivity of Gilts Fed Two-Level of Calcium and Phosphorous in Confinement.
EMME as a Selection Instrument for Swine.
Forage Systems for Backgrounding and Finishing Cattle.
Caloric Density of Diets for 3-Week-Old Pigs.
Forage Systems for Production of Beef from Conception to Slaughter.
Reproductive Physiology of Farm Animals.
Management Practices for the Early Weaned Pig.
Dietary Nitrogen Sources for the Young Equine.
Nutritional Systems for Swine to Increase Reproductive Efficiency.
Prevention of Blood Clotting and Measurement of Hormones in Ovarian Vein Plasma in the Cow.
Rectally Infused Magnesium Chloride for Prevention of Deaths in Cattle Affected with Hypomagnesemia.

Dairy Science
Innovative Materials Handling for Packaging and Distributing Milk.
Role of Energy Compounds and Hormones in Regulating Lipid Metabolism in Ruminants.
Effect of Age and Quality of Raw Milk on the Shelf-Life of the Processed Fluid Product.
Aflatoxin B₁ Consumption and Stability of Related Metabolites in Milk and Tissue.
Role of the Uterus in Embryonic Survival and Mortality.
Improving Reproductive Efficiency in S. C. Dairy Herds.
Factors Affecting Nitrogen Economy of the Bovine.
Utilization of Solid and Liquid Constituents of Manure in Dairy Waste Management Systems.
Virus Diseases Affecting Reproductive Efficiency in Dairy Cattle and Swine.
Optimizing Nutritional Management of Dairy Calves.
Influence of the Pituitary-Gonadal Axis on Reproductive Function in Cattle.
Forage Feeding Systems for Growing and/or Lactating Dairy Cattle.
Entomology and Economic Zoology

Alfalfa Insect Pest Management.
Bionomics and Control of Insects on Cotton.
Biology, Ecology and Management of Peach Insects.
Ectoparasites of Poultry and Synanthropic Flies Associated with Poultry and Livestock, Their Biology and Control.
Studies of the Economically Important Species: Mercenaria mercenaria and Macrobrachium rosaenbergii.
Integrated System for Suppression of Boll Weevil.
Control Tactics and Management Systems for Arthropod Pests of Soybeans.
Tobacco Insect Investigations.
Biology and Control of Insects Attacking Ornamental and Greenhouse Plants.
Analysis of Predation of Mercenaria mercenaria by Decapod Crustaceans.
Freshwater Food Animals.
Development of Alternative Control Methods to Mirex and Chlordane for the Imported Fire Ant.
Some important aspects of Reproduction in Feral Swine Populations in S. C.
Development and Evaluation of Soybean Cultivars Resistant to Insect Pests.
Biology and Control of Arthropods Affecting Man and Animals.
Epizootiology and Transmission of Leucocytozoonosis in Poultry.
Development of a Grower Treatment Algorithm for Insect Pests of Cotton.
Bionomics and Control of Billbugs Injurious to Corn.
Bionomics and Control of the Pecan Weevil.
Biological Control of Insect Pests of Soybeans.
Interaction of Lepidopterous Defoliation of Soybeans.
Insecticide Resistance in Beneficial and Destructive Insects in Field Crops.
A Baculovirus as a Management Tool for Velvetbean Caterpillar Populations in Soybeans.
Development of Microbial Agents for use in Integrated Pest Management Systems.
Control of Arthropods on Apples.
Control of Vegetable Insects in the Piedmont of S. C.
Identification and Distribution of Insects of Economic Importance in S. C.
Physiopathological Relationships Between Insects and Pathogens.
Habitat of Bobcats in S. C.
Pesticide Impact Assessment Program.

**Food Science**
Oral Contraceptives and Nutritional Status.
Composition, Nutritive Value and Stability of Poultry Meat and Egg Products.
Microbial Injury and Food Quality.
Factors Influencing Nutrient Absorption.
Relation of Nutrition to Porcine Stress Syndrome.
Nutritional Impact of Fat-Altered Diets.
Regulation of Pituitary Function During Post-Partum-Anestrus in Young Beef Cows.
Postharvest Physiology of Fruits.
Parametric Studies on Packaging of new Foods.
Enterotoxigenic Clostridia and Bacilli in Foods.
Nutritional Effects of Jejunoileal By-Pass Surgery.
Quality Maintenance and Control in the Marketing and Storage of Vegetables.
Fermented Peanut Foods.
Ethanol and Sodium Influence on Perinatal Development.
Effect of Light on Postharvest Fruit.
Development of Improved Soy and Peanut Protein Isolates.
Prediction of Nutritional Quality of Foodstuffs.

**Home Economics**
Patterns of Food Intake and Nutritional Health of Girls.
Erythrocyte Protoporphysine and Iron Status of Pregnant Teenagers.
Effects of Home Laundering on the Durability of Fabrics for Men's Undershirts.
Career Projections and Attainment of Low Income Youth: Changes Over Time.
Nutrition Education and School Lunch Plate Waste in Elementary Schools.

**Horticulture**
Cultural Management of Centipede Grass.
Detection and Evaluation of Plant Growth-Environment Relationships.
Breeding Edible Southern Peas.
Uses of Seaweed and Other Organic Materials in Economically Important Horticultural Crops.
Delayed Ripening and Senescence in Peaches and Other Fruits.
Breeding Watermelons and Evaluation of Watermelon and Cantaloupe Varieties.
Improvement of Turfgrass Nutrition and Associated Management Practices.
Tea—Cultrue, Ecology, Propagation and Pest Control.
Coastal Lawn Gasses, Fruits and Ornamentals.
Evaluation, Improvement, Horticultural Crops and Varieties.
Nutrition, Management, Horticultural Crops and Varieties.
Growth Regulators and Orchard Designs for Production of Peaches.
Peach Breeding.
Evaluation of Strawberry Cultivars for S. C.
Container Growing Medias and Nutrient Sources.
Nitrogen Requirements for Containerized Nursery Plants in Bark Growth Mixes.
Production, Histology, Breeding and Genetics of Mutagen Induced Dwarf Pecans.
Plant Germplasm—Its Introduction, Maintenance and Evaluation.
Improved Practices for Culture and Management of Peaches and Grapes.
Evaluation and Selecting Superior Fruit Cultivars.
Vegetable Variety Testing and Improvement.
Pre- and Post-Planting Bedding Plant Experiments and Field Evaluation of Bedding Plants and Perennials.
Carbon Dioxide Uptake-Production Ratios of Three Kalanchoe cvs. at Flower Initiation.
Watering Methods Tests with Chrysanthemum morifolium and Saintpaulia ionantha (Wendl.) Pot Plants.
Grape Germplasm Evaluation for Enological Utilization.
Development of Weed Control Practices for Vegetable Crops.
Feasibility of Mechanizing the Production of Vegetables for Fresh Market and Processing.
Apple Production.
Evaluation of Vegetable Varieties and Cultural Practices.
Breeding Germplasm Improvement, Evaluation and Genetics of Small Fruit Crops (Blueberries and Brambles).
Vegetable Production Systems for the Midland Area of S. C.
Cultural and Management Practices for Pecans.
Quality Maintenance and Improvement of Fresh and Processed Horticultural Crops.
Alternative Full-Bed Mulch Production Systems for Tomatoes.

Plant Pathology and Physiology
Integrated Plant Disease Control and Farming Systems with Field and Vegetable Crops.
Etiology, Epidemiology and Control of Pecan Diseases.
Peach Tree Short Life: A Physiological Approach.
Development and Evaluation of Rootstocks for Peaches.
Disease Control on Vegetables.
Nature and Extent of Variation in Rootknot and Cyst Nematodes.
Cause and Control of Diseases of Shade and Ornamental Trees.
Reduction of Aflatoxin Development in Corn by Cultural Practices and Breeding.
Epidemiology and Control of Fruit Diseases in S. C.
Varietal, Cultural and Chemical Control of Nematodes in Cotton and Soybeans.
Causes and Control of Diseases of Cereal Grains in S. C.
Preharvest Application of Fungicides and Their Effect on Cotton-seed Quality and Seedling Disease.
Chemical, Cultural and Varietal Control of Fungal Diseases of Soybeans.
Hoplolaimus Columbus—Effect of Biophysical Factors on Distribution, Production and Pathogenicity.
Forage Legume Viruses.
Viruses and Mycoplasma-Like Organisms Causing Diseases of Corn and Soybeans.
Mycotoxins of Corn and Other Feed Grains.
Cause and Control of Piedmont and Mountain Vegetable Diseases.
Physiological and Biochemical Mechanisms of Herbicide action.
Causes and Control of Diseases of Ornamental Crops.
White Clover Pathology, Virus and Other Diseases.
Tobacco Disease Control in S. C.
Cause and Control of Pod and Stem Rots of Peanuts.
Methodology, Dissipation and Fate of Pesticides Residue in Agricultural Ecosystems.

Poultry Science
Improving Production Efficiency of Meat Type Poultry.
Environmental Effects on Chickens.
Composition, Nutritive Value and Stability of Poultry Meat and Egg Products.
Nutrition Requirements of Market Age Rabbits. 
Rabbit Coccidiosis: Pathological Effects, Prevention and Control. 
Reproduction Characteristics and Nutritional Requirements of 
Guineas, Pigeons and Quail. 
Eggshell Quality in Avian Species. 
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Protection of Domestic Poultry Against Fowl Cholera Disease Using 
an Avirulent Pasteurella multocida Live Vaccine. 
Nutritional Factors Affecting Metabolism of Skin and Adipose 
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Efficiency of Meat Type Birds. 
Nutritional and Non-Nutritional Aspects of Leg Abnormalities in 
Turkeys and Broilers.
Experiment Station Publications, 1979-80

Bulletins


SB 625—Profiling South Carolina's Agricultural and Home Economics Students. Thomas A. Lyson, Leola Adams, Carol A. Bocan and Anne L. Huber.

SB 626—Relative Humidity in South Carolina. Alex J. Kish.


SB 628—Agronomic and Chemical Effects of Removing the Four Bottom Leaves from Flue-Cured Tobacco at Various Stages of Plant Growth. R. E. Currin, III and John B. Pitner.

Circulars


Technical Bulletins


Research Series

RS 623—Child Care in Rural Areas of the Carolinas.

Agricultural Economics and Rural Sociology


Agronomy and Soils
101—A Comparison of Aflatoxin Levels in Pre-Harvest Corn from the S. C. Coastal Plain for 1977-78. Alfred Manwiller and Bruce Fortnum.

Animal Science
38—Annual Swine Research Reports. Compiled by Dale L. Handlin.

Horticulture
Technical Contributions
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1717—Quantitative, Radial Diffusion Slide Assay for Staphylocoagulase. J. D. Kohl and M. G. Johnson.

1718—Fungi Associated with Vegetative Buds of Camellias in South Carolina. Luther W. Baxter, Jr., Wesley Witcher and Susan G. Fagan.

1719—Fusiform Rust in Planted and Direct-Seeded Longleaf and Slash Pine Plots in the Sandhills Area of South Carolina. Wesley Witcher, Carl L. Lane and Luther W. Baxter, Jr.

1720—Subsequent Performance of Calves Held at or Near Birth Weight for the First Three Weeks of Life. B. F. Jenny and G. D. O'Dell.

1721—The Effect of Maize Dwarf Mosaic Virus Infection on Yield and Stalk Strength of Corn in the Field in South Carolina. Graydon C. Kingsland.


1726—Modeling Crop Growth. Gaines E. Miles.


1730—Nematodes and the Replant Problem in Fruits. Eldon I. Zehr.


1736—Identification of Peach Cultivars Through Protein Analysis. George E. Carter, Jr. and Myrial M. Brock.

1737—Loss of Pesticides from Congaree Sandy Loam with Time: Characterization. Kermit S. LaFleur.


1739—Yields and Composition of Edible and Inedible By-Products Processed at 6, 7 and 8 Weeks of Age. S. W. Crawley, D. R. Sloan and K. K. Hale.


1742—Possible Association of Both Scutellonema brachyurum and Macroposthonia xenoplax with the Peach Tree Short Life Syndrome. W. C. Nesmith, E. I. Zehr and W. M. Dowler.


1749—The Effect of Preinsemination Factors on Fecundity of Stored Chicken Semen. W. D. Resseguie, B. L. Hughes, J. E. Jones and R. J. Thurston.
1753—An Evaluation of Gelatin as a Diluent Component for Storage of Chicken Semen. W. D. Resseguie.
1754—Interseasonal and Interannual Stability of Combining Ability for Forage Yield in Orchardgrass. E. F. McClain.
1755—Camellia Flower Buds Affected by the Dieback Fungus, Glomerella cingulata. Luther W. Baxter, Jr. and Susan G. Fagan.
1756—Effects of Low-Stalk Tobacco Discarded in the Field on Tobacco Flea Beetles. Albert W. Johnson and Donald G. Manley.
1760—Parasites of Lepidopterous Larvae in Insect Resistant and Susceptible Soybeans in South Carolina. Gloria S. McCutcheon and Sam G. Turnipseed.
1761—Potential for Ambient Air Drying in South Carolina. Joe M. Bunn, William R. Lea, Jr. and Gordon Hammond.
1763—Gonadotropic and Ovarian Hormone Response in Dairy Cows Treated With Norgestomet and Estradiol Valerate. M. A. Barnes, G. W. Kazmer and S. T. Bierley.
1764—Effect of Fat Level in Peanut Milks on Acid Production. Maryanne Tsivitse and M. G. Johnson.


1767—Shading and Weed Suppression by Soybeans as Influenced by Planting Date. T. R. Murphy and B. J. Gossett.


1771—Phoretic Relationships Between Chironomidae (Diptera) and Benthic Macroinvertebrates. Tina R. White, John S. Weaver, III and Richard C. Fox.

1772—Resistance in Tobacco to the Green Peach Aphid. Albert W. Johnson.


1775—The Response of Glomerella cingulata, the Cause of Camellia Contagious Dieback and Canker, to Various Fungicides Under Laboratory Conditions. L. W. Baxter, Jr., Kathy Ellers, Wesley Witcher and Susan G. Fagan.

1776—Pinewood Nematode Found in South Carolina. Wesley Witcher, Luther Baxter and George E. Carter, Jr.


1787—Field Infection of the Red Imported Fire Ant, Solenopsis invicta, with the Fungus Beauveria. E. C. Quattlebaum and G. R. Carner.


1789—Simulated Natural Air Drying in South Carolina. William R. Lea, Jr., Joe M. Bunn and Gordon Hammond.


1792—Virus Infection of Trifolium Species in Cell Suspension Cultures. Roger A. Jones, Earlene A. Rupert and Ortus W. Barnett.


1800—Description and SEM Observations of Dolichodorus marylandicus n. sp. with a Key to Species of Dolichodorus. Stephen A. Lewis and A. Morgan Golden.


1802—Effect of Water Hardness on Growth and Production of Macrobrachium rosenbergii Postlarvae. Christopher A. Aas and Arnold G. Eversole.


1806—Biology of Pristhesancus papuensis Stal, an Assassin Bug from Australia. Merle Shepard and Randy McWhorter.

1807—Toxicity of Mirex to Postlarval and Juvenile Macrobrachium rosenbergii. Christopher A. Aas and Arnold G. Eversole.


1809—Lead-Lag Relationships Between Pork Prices at the Retail, Wholesale and Farm Levels. Stephen E. Miller.

1810—Forecasting South Carolina Tomato Prices Prior to Planting. Gary J. Wells.
1811—Assay of Naturally Occurring Estrogens in Bovine Tissues. Donald M. Henricks.

1812—Sex Differences in Recruitment to Agricultural Occupations Among Southern College Students. Thomas A. Lyson.

1813—Only a Few: Recruitment to Farming Among Southern Blacks. Thomas A. Lyson.

1814—Factors Associated with the Choice of a Typical or Atypical Curriculum among College Women. Thomas A. Lyson.


COOPERATIVE EXTENSION SERVICE  
Wayne T. O'Dell, Director

From the urban apartment dweller to the veteran soybean farmer, the Cooperative Extension Service offers statewide continuing education programs that can benefit every South Carolinian. These cover 16 disciplines relating to agriculture, home economics, youth and community development, programs for the economically disadvantaged and educational information, and are offered under an agreement between Clemson University and the United States Department of Agriculture.

Funded by federal, state and county governments, the Extension Service was created in 1914 as a nationwide system designed to carry education from land-grant universities to the people. In the 66 years since, Extension has worked hand-in-hand with South Carolinians helping them build a better life through dissemination of practical, useful information on matters within its assigned areas of responsibility.

Extension was originally conceived to help rural people. It has responded to the changing needs of those it serves by broadening its scope of activities to include many urban and suburban problems.

Extension is actively involved in national and State efforts to help people improve their skills, earning capacity, nutrition and health and to attain the educational, personal and social attributes that will help them raise their standards of living.

Through Extension, Clemson University maintains an office in each county seat staffed by county agent personnel. A professional staff of Extension subject matter specialists stationed at the University and at three Experiment Stations around the State compiles information from research results and translates this into data the people of South Carolina can use in their daily lives.

Whether the classroom be a corn field, 4-H field trip, interior decorating demonstration or a gathering of a local or State government body, Extension staff members are teachers carrying Clemson University outreach educational programs to all areas of South Carolina.

Extension's work is organized around six broad categories: agricultural programs, 4-H and youth development, home economics, community and resource development, special programs for farmers in "low income" agriculture, and 1890 programs conducted by South Carolina State College in cooperation with the Clemson University Extension Service.
Agriculture and Natural Resources

Activities in the Extension classroom are directed toward solving problems, and that often means the most effective place to work is the soybean field, wood lot or a farm shop.

Extension education tends to be informal, tailored to individual needs and time and budget requirements.

The delivery system is designed to deal with the unexpected and the uncommon, and requires a substantial amount of planning. Agricultural programs in Extension rely more and more on videotape, computers and mass communication. This system reaches more people, is less costly and is consistent with the budget and energy restrictions facing people in South Carolina.

When Extension began, it worked toward improved farm production practices. Later, the importance of marketing emphasis was realized. Still later, agribusiness and international trade and government regulation demanded the farmer be educated in those areas.

Agricultural and natural resource producers provide food and fiber for this nation's millions. Through their exceptional, efficient efforts, more people are released to help produce less basic needs. The Cooperative Extension Service of Clemson University has been part of improving life for everyone since 1914. Highlights of Extension activities in some dozen departments at Clemson and in the State's 46 counties follow.

Agricultural Engineering

This year Extension agricultural engineers have been initiating and fielding educational and demonstration energy programs. An interdepartmental tabloid, "Energy Focus," on energy conservation in the home and on the farm was published and circulated to 75,000 individuals in connection with International Energy Conservation Month in November 1979. This proved to be a timely media effort that served an educational need for the general public.

Both home owners and farmers have expressed intense interest in learning more about alternate energy sources. Individual and group contacts have been numerous in the areas of solar energy, wood fuel, methane biogas generation, on-farm alcohol fuel production and energy production from agricultural residues.

Educational efforts to meet interest in these subjects included in-service training for county Extension personnel, tours to production facilities and preparation of educational materials such as a bulletin entitled "Ethanol Fuels and Feed By-Products."
In addition, a monthly newsletter, "Housing Update," was initiated and is produced jointly by Extension Agricultural Engineering and Home Economics. It includes subject matter for county Extension personnel and timely information for the homeowner.

Extension Agricultural Engineering also conducts programs in agricultural production. Irrigation is having a major impact on agricultural production in South Carolina. With 15,000 new acres of cropland irrigated during 1979-80, the total irrigated acreage rose to 75,000 acres. Educational efforts have begun to develop criteria for optimum systems with minimal energy inputs in both tillage and irrigation scheduling techniques. The current types of irrigation systems include center pivot supplied by wells in the large fields of the Coastal Plain, trickle in orchards and truck crops and traveler systems in both Coastal Plain and Piedmont areas.

Other irrigation educational efforts this year included revision of three publications for irrigated crop production and tours co-sponsored with the Irrigation Society of South Carolina, equipment dealers, producers and agricultural agencies.

Crop processing remains an integral part of on-farm agriculture. Recent figures indicate 87 percent of the flue-cured tobacco is cured in bulk barns. This method of crop processing transition required that we conduct a bulk curing clinic for county Extension agents in 16 tobacco producing counties.

Other educational efforts in the area of crop processing were sunflower harvesting and drying clinics and grain drying and storage clinics for county Extension personnel.

A proposal was developed for acquisition of funds from EPA, DHEC and LRCC for a "208" educational program for South Carolina agriculture. Extension Agricultural Engineering will be in charge of this two-year program.

Use of computers in agriculture production and processing is expected to accelerate in the immediate future. To prepare for these developments, agricultural engineers were able to acquire basic computer equipment for off-campus demonstrations and instruction.

The farm building plan service is an integral part of the education efforts of the Extension program. About 10,000 plans including residential housing plans, Extension bulletins and related leaflets were distributed in the past year. This office also participated in the development of plans for the Swine Demonstration Center at the Pee Dee Experiment Station.
Agronomy

Farming, like almost every profession, is changing rapidly and its practice requires constant updating. Through its State staff and 46 county Extension offices, Extension Agronomy attempts to stay in the forefront of new agricultural developments and trends and to take these quickly to farmers.

Agronomy provides a multitude of advisory and educational services to South Carolina farmers.

Practical information on production practices for minimum-tillage of corn and soybeans was presented at 12 regional conservation tillage meetings in the State. These meetings were attended by over 1,200 growers and related personnel. The growers attending represented 30 to 40 percent of the total corn and soybean acreage planted in the Palmetto State.

Extension Agronomy, Agricultural Engineering, Plant Pathology, Entomology and Agricultural Economics specialists cooperated with State soil conservation service personnel in preparing a 30-minute slide presentation, “Minimum-Tillage . . . Will It Work for You?” This slide presentation was shown at the 12 meetings and also made available for use by county SCS and Extension staffs to explain the concept of minimum tillage to growers.

Over 75 on-farm test demonstrations were conducted by agronomy specialists. These involved fertility trials on corn, tobacco and soybean variety demonstrations, weed control in corn, cotton, soybeans and small grain, and other crop production practices. From 1,500 to 2,000 farmers and agribusiness personnel visited these on-farm demonstrations.

Two educational efforts in tobacco were the top-early program and dropping the bottom four leaves from the stalk. The top-early program placed special emphasis on reducing MH residues, which are becoming a critical issue in exporting tobacco. The bottom four leaves program is aimed at increasing profits for tobacco growers.

A series of intensive grazing management demonstrations was carried out this year and could result in a more profitable beef cattle industry in the State. Results from these tests demonstrated that under sound, intensive management, thousands of acres of pastureland in South Carolina can provide additional grazing for beef cattle.

During the past 12 months, the number of soil samples submitted to the soil testing laboratory by farmers and homeowners was
78,274. This completed the second year with the computer program for making fertilizer recommendations and has saved several man-years for county Extension staffs.

Animal Science

Extension Animal Science develops and implements statewide educational programs for beef, swine and horse enterprises. Most beef and hog production units are operated with an expectation of profit. Superior management and marketing are the key to realizing these expectations.

Strong beef cattle markets depend on offerings of high quality, well-managed cattle. The higher the quality and reputation of the herd, the easier it is to market. Extension Animal Science specialists, working mainly with county livestock associations, stressed the tie-in between beef management and marketing at several dozen county meetings during the past year.

Producers in Chester, Lancaster and York counties have organized a beef marketing association which culminates five years of Extension effort in upgrading herd genetics and improving production practices. Feeder calf sales in Laurens and Saluda counties were built around improved quality and uniformity.

The South Carolina Gain-Tested Bull Sale held in February featured 84 bulls of eight breeds from outstanding herds across the State. This program makes available superior breeding stock to many producers in the Southeast.

Efficiency has been the key to survival in swine production. In South Carolina, 636,000 swine were sold in 1979, excluding interfarm sales. Simple management practices are being brought to the pork producers’ attention. Staying in business requires that genetic improvement, feed efficiency and herd health be foremost in producer planning.

About 60 tested boars were sold at the Swine Evaluation Center. These animals offered performance, quality and sound features unequaled in the State.

Agricultural statisticians often overlook the importance of the horse industry. In cooperation with the South Carolina Horse Council and its member associations and the S. C. Department of Agriculture, Extension undertook a survey of the size and importance of the horse industry to the State.

The study showed that almost $29 million is spent annually maintaining South Carolina’s 66,000 horses. The industry has well
over $150 million invested in animals, land, equipment and buildings. Extension education with horse groups will continue as this enthusiastic movement develops.

Dairy Science

Dairy Extension personnel continue to work with dairy farmers and other related businesses throughout the State to provide consumer educational material for this important agribusiness.

A milk testing laboratory involving Alabama, South Carolina and Georgia was organized with primary leadership coming from South Carolina. This laboratory will enable dairymen to obtain protein testing, increased somatic cell testing and faster turn around time for Dairy Herd Improvement Association (DHIA) records.

The first dairy herdsman school was held at Clemson, and a survey of calf-rearing in DHIA herds in the State was conducted.

The dairy products survey is still in progress. The re-evaluation and reporting stage has been reached and complete details will be available this year.

Planning continues for the expansion of the dairy science programs which are now reaching more than 2,500 students in schools each year.

Consultation was made with dairy plants that have experienced difficulties with quality as a result of reduced maintenance budgets.

Sixty to 65 percent of the State's dairymen were reached through county Extension agents with dairy cattle feeding programs. This continues to be a primary target since feeding accounts for nearly 60 percent of the cost of producing milk.

Dairy Extension personnel worked with 100 dairymen on utilization of total mixed rations using mixer-weigh wagons and analyzed over 500 samples for nutritional composition through the S. C. Forage and Grain Testing program and the Department of Agriculture Laboratory. They also worked with about 75 dairymen on feed formulations through use of Silent-700 portable data terminals and another 15 through the feed program offered through DHIA.

Fifteen educational programs were presented on the latest feeding programs to assist dairymen with nutrition-related problems in their operations.

More than 50 dairymen who are utilizing wet brewers grain, whole cottonseed and other by-products in their feeding programs were helped by Extension Dairy Science. Extension Dairy Science participated in 15 meetings, seminars and conferences on utiliza-
tion of wet distillers grain from production of alcohol on the farm and larger alcohol production installations.

Dairy scientists also initiated the successful spring dairy show at Clemson at which more than 200 animals were exhibited by adult breeders and 4-H members.

**Entomology and Economic Zoology**

Extension Entomology reassigned responsibilities during 1979 so that each district now has its own field crop entomologist. This has improved entomological support to the counties.

Integrated Pest Management programs (IPM) in various field crops were initiated. Cotton continues to benefit from the very successful pest management program begun in 1972, and the IPM concept is now considered a standard practice.

Soybean IPM practices are gaining strength in the State. The research entomology team at the Edisto Experiment Station is developing new strategies for soybean IPM which will cut insect control costs and reduce insecticide impact.

Tobacco is another crop where IPM progress is being made. The benefits of protecting predatory parasites and economic thresholds for tobacco pests are areas now being evaluated by our Pee Dee research entomology team.

For the third consecutive year, IPM was a success on the low-country tomato crop. Growers produced a good crop with no serious problem from vegetable leaf miner, and insecticide sprays were cut 50 percent with no loss in yield or quality.

Apples and peaches are other crops where IPM practices are now being accepted by growers. Peach growers pay $10 per acre for such services as insect monitoring, soil testing and leaf analysis. Apple growers are participating in a pilot program involving insect and disease monitoring which allows growers to treat when needed rather than on a schedule.

The “Insect Hotline” was expanded for the 1980 season to both the Pee Dee and Savannah Valley districts. This insect alert service should help growers and Extension workers stay on top of pest conditions in the field.

Entomologists continue to direct the pesticide applicator training program which has been and still is a success story. Many applicator groups (pest control operators, aerial applicators, etc.) continue to ask for the training program.

In wildlife, continued interest in aquaculture was manifested in the demand for farm pond management clinics. Several hundred
pond owners attended to learn about such concerns as fish culture and weed control. The department's wildlife specialist was instrumental in organizing a regional aquaculture Extension group recognized by ECOP.

In the upland game area, our Extension wildlife specialist planned and helped execute a statewide interagency workshop for upland game management. These workshops provided a means to coordinate interagency efforts to assist landowners with game problems.

A statewide 4-H wildlife project to plant food plots for small game is being initiated during 1980. Several hundred 4-H'ers will participate in this joint project with the S. C. Wildlife and Marine Resources Department and S. C. Wildlife Federation.

Food Science

More than 3,100 notices of proposals, changes and new federal and State regulations were distributed to more than 1,050 South Carolina food industry companies by the Food Regulation Information Filter Center (FRIFC) during the past year. This activity enabled the industry to take part in the promulgation of new regulations and avoid possible citations, fines or adverse publicity by having lead time to implement necessary changes to assure regulatory compliances.

Food Science provided technical knowledge and skills to enable one South Carolina company to become one of three national contractors to produce Meals-Ready-To-Eat for the U. S. Military Command. This military food program implements retortable pouch food preservation for worldwide distribution of a superior field ration for the United States serviceman replacing the familiar C-ration.

Food scientists developed and demonstrated the feasibility of processing pasteurized flaked crab meat in five-pound plastic flexible bags; established thermal processes to safely preserve crab roe, lobster spread and two seafood soups; assisted in the development of a fermented okra product now marketed by a South Carolina vegetable processor; helped develop a feasibility study for a sweet potato cannery in Horry County; and provided on-site good manufacturing practice advisories to 15 community canneries.

In another area, Food Science collaborated in the development and construction of a prototype closed-loop food process waste discharge abatement unit. The feasibility and efficiency of the unit will be demonstrated initially. If practical, the unit will allow prolonged use of brine solutions to separate crab and oyster meat.
from the shell. Prolonged use of the brine solutions (which now
must be changed once or twice per day) will reduce the discharge
of salt-polluted waste, conserve processing water and increase
product yields.

Food Science also helped prepare an alcohol fuels manual and
participated in eight public seminars dealing with the production of
on-farm alcohol.

In other projects, food scientists organized and conducted a low
acid food shortcourse for Food and Drug Administration certifica-
tion of food processors; participated in statewide warehouse sanita-
tion and catfish regulatory seminars; provided leadership in several
food processor trade and professional associations; and conducted a
food preservation in-service training workshop for home economists.

Forestry

Publications on forestry as an investment and the use of fire as a
management tool along with a forestry field day for youth high-
lighted Extension Forestry activities for the past year.

Last fall a forestry field day of competitive educational and fun
events was staged at Clemson for young people from six counties
in the Piedmont. The event was so successful it has led to the de-
velopment of a statewide program for youth interested in forestry.
Three field days are planned for the fall of 1980, and a State com-
petition is slated for 1981.

Extension Forestry, in cooperation with the Southern Forest Insti-
tute, authored a circular titled "Forestry as an Investment: How to
Compare Planted Pines to Other Investments." This publication has
been well received with 20,000 copies printed last fall and a slightly
revised version to be printed this summer. Additional publications
on forestry as an investment are planned during the coming year.

A variety of studies have identified a reforestation problem in
South Carolina. In response, Extension Forestry has initiated a series
of video tape and printed items to assist landowners in under-
standing the reforestation crisis. Landowners are being encouraged
to consider methods of reforestation other than intensive site
preparation which was emphasized during the 60s and 70s.

For several decades, landowners have been taught that fire in
their woodlands was disastrous. Recently foresters have learned fire
can be one of the most beneficial tools for pine management. Ex-
tension Forestry has produced "Fire in the Forest: Good and Bad," a
publication designed to show landowners both sides of the fire
picture. When properly used, fire can achieve many economic bene-
fits for the landowner and can be used as an aid in fireproofing a stand against the dangerous wild fire. This publication is also designed for use with lay audiences, people who play a significant role in determining what forestry practices can be performed on the forest lands of our State.

**Horticulture**

Responsibility for disseminating information on fruit, vegetables and ornamental crops in South Carolina is assigned to Extension Horticulture. The unit is primarily production oriented but also is involved in postharvest handling and marketing.

Pest management programs with horticulture crops have headed Extension Horticulture accomplishments this year. Programs on peaches, tomatoes and apples have been conducted with grower support ranging from nine to 100 percent. More important than the pesticide dollars saved by these programs is the change in attitude by the growers. They are now aware that routine application of pesticides isn’t necessary in all cases.

Extension programs in home horticulture have reached approximately 300,000 families through publications and mass media. The annual value of home horticulture in South Carolina is over $200 million. These families have increased their management skills at considerable dollar savings. Energy conservation has been a major topic with commercial ornamental growers. As a result, a five percent energy savings has been realized. Methods of reaching these growers have been primarily newsletters and workshops.

Small farm programs in vegetables have been offered in 40 counties, and direct-to-consumer markets have been established in 26 counties. These markets have returned an estimated increase of $2 million annually in farm revenue to those growers, mostly small farmers, who market through them. Through demonstrations and meetings with these farmers, Extension agents are presenting information on how they can increase production efficiency and show even greater gains.

Horticulture programs in pecans are being redesigned to include both rejuvenation of old orchards and plantings of new orchards. Statewide shortcourses in this area have reached approximately 90 percent of the growers. As a result, they have begun irrigation and machinery improvement.

Apple quality demonstrations have been conducted and designed to reach proper harvest maturity for quality maintenance. Approximately half the apple growers in the State have been exposed to these studies.
Noteworthy accomplishments were made in Extension Plant Pathology in integrated pest management, disease detection and written materials for county staffs.

Integrated pest management programs either in part or in total appear to be a means of improving control of pests at perhaps lower cost. Plant disease control is part of this program. In 1980, an Extension program was organized assigning one plant pathologist to handle all nematode samples related to pest management programs.

This pathologist has helped organize, analyze and promote procedures and recommendations resulting from the pest management programs. Specifically, the number of nematodes needed to cause economic losses to several crops was established, and the concept of forecasting the need to treat was tested successfully.

A program designed to implement research information for control of fruit diseases was maintained, and the results showed that disease management is possible for peach scab and brown rot. We believe this program to be best in humid peach-producing areas of the world.

A program to better solve crop production problems was initiated in 1979-80, and the ability to identify new plant pathogens has increased dramatically. Pesticide resistance, new races of fungi and nematodes, and organisms that have the potential to be pests can be handled at this time. Extension’s potential as a problem-solving unit has increased, and services are being added as equipment and space are attained.

Providing readily accessible information on a given plant disease was a goal of Extension Plant Pathology this year. Major effort was put into providing concise fact sheets for county Extension personnel. The material has been prepared, and the printed material will be in circulation soon.

During the past year the following was accomplished by Extension Poultry Science.

Eighteen new Pullorum-Typhoid bloodtesters were trained and licensed, leading us to the threshold of a state free of this disease.

Fifteen poultry servicemen were trained in our poultry servicemen’s school at Pontiac. The last day of the school was held in conjunction with the Clemson University Health and Management Shortcourse and attracted 60 persons.

Numerous potential turkey, broiler and egg producers were given practical information concerning commercial production needs,
contracting and cash flow. This resulted in several new producers, especially in Oconee County broiler production, and some turkey producers.

Four production management meetings reaching 300 producers were held at the request of county and/or company personnel for growers with all four broiler production companies headquartered in South Carolina.

A Poultry Processors and Distributors Council was organized to conduct the S. C. Chicken Cooking Contest and consider problems of mutual interest.

One integrated broiler producer received guidance from Extension Poultry Science concerning high death loss of broilers in periods of high heat and humidity. A poultry specialist, with assistance of a supply company, designed a new holding shed for cooped broilers. Although a full year's data is not available, losses have run several thousand dollars less than previous years due to its use.


Specialists worked with hundreds of individuals in dealing with fly control, manure management, housing, feeding, breeds and varieties, processing, harvest technology as well as the integrated companies.

More than 100 radio tapes were made as well as numerous interviews on TV, radio and by newspapers.

Production-Marketing Economics

Providing educational programs and training to farmers, agribusinesses, Extension agents and the public about agricultural marketing, farm management, financial management, agribusiness management, estate planning, income tax management, agriculture policy and trade, computer applications, youth (4-H) and consumer economics are the basic functions of the Extension Production-Marketing Economics group.

These programs are conducted through farmer meetings, workshops, newsletters, publications, on-farm consultations, multi-disciplinary meetings and the mass media.

Farmers and agribusinesses operate in an environment of risk and uncertainty created by inflation, energy shortages, changes in supply and demand, price cycles, weather and other economic forces. The major thrust of Extension Production-Marketing Eco-
omics in 1979-80 was to provide farmers and other firm managers with the economic training and tools of analysis to do a more effective job of managing risk and uncertainty. Risk management is reflected in decisions pertaining to what and how much to produce, marketing, financing, estate planning, income tax management and agricultural policy.

The following programs were conducted to assist managers in improving their information base and ability to make decisions and manage risk: 17 marketing workshops and seminars; 12 farm management workshops and seminars; 25 outlook presentations; 20 county meetings of approximately 2.5 hours length on agricultural policy, income taxes, estate planning, farm management and marketing; four training sessions with agricultural leaders; four training sessions for county Extension agents on farm management, marketing and policy; one statewide workshop on micro-computers; several management sessions for low-income and commercial cooperatives; five schools for tax practitioners (500 participants); and numerous county visits for consulting with farmers.

Gasoline production and a computer record analysis program for dairymen were new programs added in 1979-80.

Literature development is a major part of the program. Last year, newsletters were prepared for “Outlook Updates” and “Management Marketing Memos.” Publications included “Extension Economics Reports,” leaflets and circulars. These materials covered a broad range of information on outlook, financing, planting decision, agricultural policy, tobacco, irrigation, leasing, income and estate taxes.

Estimated budgets for the major field crops and livestock enterprises were prepared and used extensively in production, policy, financial lending and marketing decisions. Additionally, weekly marketing reports for peaches, cucumbers, cotton and commodity futures were prepared.

With the increased emphasis on forward contracting, hedging, cash flow analysis and budgeting, producers must look logically at alternatives before making commitments. Computer programs dealing with cotton, corn, soybeans, wheat, livestock, cash flow analysis and enterprise budgeting have been written and are currently available to producers.

These programs were used extensively in 1979-80. Computer applications are being expanded to include the micro- or personal computers that farmers can use in their homes.
Community Development

Scope of Activities

Through the Extension Community Development (CD) program, communities are provided educational and technical assistance in efforts to improve the quality of life in rural areas. The objective is to improve decision-making processes regarding the development of human and natural resources and to provide leaders with timely information on a wide range of development-related issues.

In most cases, CD projects benefit the whole community and require that a large number of citizens share the costs as well as the benefits.

CD emphasis is placed on assisting community leaders, governing officials, organizations and professionals in other agencies to understand and solve community problems and to obtain maximum benefits from community resources through wise utilization.

Leadership, Problem Surveys

Since April 1979, surveys have been conducted in six communities, two on a countywide basis. Additional surveys are under way in three communities. Meetings to present survey results have drawn excellent participation from local community leaders, elected officials and resource agency representatives. Identifiable results include the establishment of several community improvement committees, increased interaction between elected officials and community leaders, greater utilization of Extension's services and enhanced image of county and State Extension offices as a resource for community development efforts.

Organizational Assistance

Extension continues to assist the Governor's Office in conducting a cooperative annual program, "Emphasis/South Carolina," at which outstanding community efforts in beautification and community improvement are recognized through award presentations at an annual luncheon. This year's program attracted 250 persons from 35 counties. Extension provides organizational support for local and county beautification and community improvement committees which participate. Five regional workshops were conducted to assist communities and county Extension personnel in organizing and improving local committees. An average of 40 persons took part in each workshop.
Land-Use and Community Planning

Three one-day regional land-use workshops were held in 1980 to increase county Extension professionals' understanding of land-use issues affecting agriculture and rural communities. Extension CD specialists also participated in three regional workshops sponsored by the local government training division of the S. C. State Budget and Control Board. These were on economic development, community improvement and local planning in South Carolina. The program, designed for local officials and professional planners, was developed through Extension CD and Clemson University's Department of Planning Studies.

Extension assisted the Southern Rural Development Center in conducting a regional workshop for the National Agricultural Lands Study. CD specialists helped with group discussions at the workshop held in North Carolina.

Local Government Assistance

In cooperation with the S. C. Municipal Association, Extension has developed a computerized word processing program to assist small towns in developing personnel policy procedure manuals. To date, manuals have been completed for two communities, and additional requests have been received for this service. A retail business survey was conducted in one community to determine additional commercial needs in conjunction with a comprehensive downtown revitalization effort.

CD is engaged in the development of a fiscal impact model to help communities analyze consequences of providing necessary community services for proposed industrial development. Additionally, local government assistance efforts have included help to fishermen and shrimpers in coastal communities in establishing a cooperative capital construction fund; assistance in analyzing community tax base and revenue potential; assistance in developing operating and capital budgets for small towns; assistance in developing rural fire protection organizations; and assistance to local planning commissions in analyzing land regulations ordinances.

Information and Educational Materials

Circulation of the Extension CD newsletter has increased to 1,500 monthly. Video tapes were produced on water rights and irrigation, community industrial development and land-use planning.

Federal Assistance Programs Retrieval System (FAPRS) brochure applications were revised, and use of this service is increasing.
FAPRS demonstrations were conducted at one county Extension meeting and at the National Black Mayors Conference held in Columbia.

**Home Economics**

**Scope of Activity**

Extension Home Economics is organized to deal with man's physical environment and his nature as a social being through five subject matter areas: child development and family relations, clothing and textiles, family resource management, food and nutrition, home furnishings and housing.

Information on these subjects is delivered by county Extension agents whose primary responsibility is home economics education for youth and adult students. This base is supported by a staff of State specialists in each subject, the U.S. Department of Agriculture and the Federal Extension Service. Research is carried out, findings interpreted and related to problems of South Carolina, and educational processes developed to solve them.

Since prevention of problems is more desirable and less costly than correction, Extension Home Economics is proactive as well as reactive. Research, new knowledge, national and State trends all serve as indicators for proactive educational efforts. As a result of Extension Home Economics, individuals and families are more able to identify needs and opportunities and make decisions on living more effectively in a complex world.

A brief overview of each subject matter area for 1979-80 follows.

**Child Development and Family Relations**

This department served as the lead agency for the White House Conference on Families in this state with the family life specialist serving as State coordinator. Members of the staff worked to implement the State orientation meeting and design the format for the 46 county conferences.

Conferences were well promoted by the press, and over 5,600 persons attended to outline problems facing today's family and suggest solutions. Four main goals of the county conferences were: to focus on existing strengths of families; identify the most crucial problems facing families today; make recommendations for solving these; and examine the effect of state policies and regulations on family life and identify harmful ones.

The county groups pinpointed the major topics or problems affecting the family and identified them as follows: financial concerns,
lack of parenting skills, substance abuse, decline in spiritual and moral values, family disunity, lack of communication skills, family violence, unemployment, teen pregnancy, housing, and care of the elderly.

Twenty-four South Carolinians were nominated to attend the national conference in Baltimore in June. Results of the White House Conference on Families are already being seen on county, state and national levels as steering committees implement action plans.

In addition, family life programs were conducted for 90 percent of South Carolina families. The parent/child interaction project continues to reach hundreds of families with young children and is expanding to additional counties.

**Clothing and Textiles**

Major emphasis in this area was on helping families cope with inflation and lower clothing budget. One hundred Extension home economists were trained in ways to repair children's clothes, how to comparison shop for children's clothes and how to recycle women's fashions. Eight leaflets, four video tapes and two teaching kits were developed to provide county personnel support materials. Seventeen radio scripts and 28 news releases were sent to home economists on buying and care of clothes and energy conservation through the correct use of clothes.

Two daily papers carried a series of articles by Extension clothing specialists on getting the best value in fall fashions and back-to-school clothes.

A series of short video tapes and instructional leaflets on speed tailoring was developed for introduction into the counties this fall. Volunteer leadership is essential to the Extension Home Economics program, so home economists were trained on effective techniques for teaching volunteers to teach others.

Helping youth to recognize the importance of self-image in personal development and for future employment is part of a special 4-H youth grooming program that attracted 220 4-H'ers during the year. Another program, clothing for independent living, was given in almost every county. Through fashion shows and exhibits, this program demonstrates how clothing can be easily adapted for the handicapped.
Family Resource Management

Concern about inflation generated much activity among home economics specialists, including a three-day statewide in-service training session for county personnel. A large notebook on inflation fighting techniques was created containing publications in all home economics subject areas as well as suggested newspaper, radio, television and newsletter articles. The notebook also contains a home study course on money management.

During a one and a half day meeting held in conjunction with the annual Extension conference, 140 county staff members were exposed to home economics trends projected for the coming year. Again this year the special interest meetings on wills and estate planning proved popular in the counties.

Information on energy conservation has been requested frequently this year, and a publication was developed explaining a new law listing the energy consumption of certain appliances. In the area of youth, six subdistrict training sessions were held to present a new series in 4-H consumer education to county agents. The women’s division of the S. C. Bankers Association has been a prime sponsor for the computerized budgeting analysis program called “speedy spend” in several locations in the State. Utilizing this program, individual banks may decide to sponsor processing of customers’ budgets at bank expense. This cooperative effort of banks and the county Extension Home Economics staffs is being continued into 1980-81.

Special audiences were reached in certain locations at the request of county agents. One such program was presented on financial management through three major department stores in Greenville and Easley.

Food and Nutrition

The Extension Home Economics Foods and Nutrition program has concentrated educational programs in three major areas: wise use of food resources, nutritional status as it relates to good health and the nutritional needs of children.

Selected county Extension agents were trained on how to combat inflation in buying, preserving and preparing food. Since meat takes the highest percentage of the food dollar, a six-lesson home study course was developed on buying, storing and preparing meats and meat alternatives. Due to the tremendous interest in food preservation, over 75,000 copies of the Home Gardening and
Preservation manual were printed in 1980, and emphasis was placed on drying foods at home.

South Carolina ranks second in infant mortality rate. Roughly 25 percent of the births in South Carolina occur to women 19 years of age and younger. Many of these pregnancies result in infants who die or have a poor beginning. Selected Extension agents received training in teenage pregnancy. Emphasis was given to nutritional status during pregnancy as a cooperative effort with other agencies and organizations.

A 16-lesson program, "Eating Slim," was begun in 25 counties. Extension is also conducting programs to familiarize consumers with USDA/HEW dietary guidelines.

To assist parents of preschoolers in meeting the nutritional needs of their children, a home study course, "The Preschooler and Food," was revised and reprinted. Through the 4-H Foods and Nutrition program, a new lesson series on food combinations was developed. Many youngsters enrolling in 4-H chose foods and nutrition as a project. New materials adapted from Georgia have been developed for use by volunteer leaders.

Expanded Food and Nutrition Education Program

In 1969 the Expanded Food and Nutrition Education Program (EFNEP) was launched to attack the widespread problem of poor diets in America. During the decade, carefully selected educational methods have resulted in EFNEP emerging as a highly successful program in changing dietary patterns and behaviors and effecting better management of total resources. The 4-H EFNEP phase concentrates on the ages 9-19.

Since 1969, the EFNEP program has reached 31 counties. For the first six months of the current fiscal year, 3,511 families have been involved in the adult phase of EFNEP in South Carolina, and 3,169 young people have been reached through 4-H EFNEP. Volunteer leaders continue to be recruited and trained, and an increasing number of enrolled homemakers who graduate are assuming volunteer responsibilities in 4-H EFNEP leadership. In an effort to enhance the relationship between EFNEP and other agencies, especially the food stamp program, a larger percentage of food stamp recipients has been enrolled.

Home Furnishings

There is a widespread revival of do-it-yourself decorating among clientele. Needs in this area are being met by an increased number
and variety of Extension programs on home furnishings. The 4-H 24-hour room service short course is attracting more youngsters, and volunteer leaders are being trained in one district. In-service training sessions or workshops on furniture restoration have been held in most counties with more planned in the coming year.

In December, an interdisciplinary approach was used to update all home economists and to forecast the trends for the 1980s.

**Housing**

A three-day session provided training for housing agents in many important areas including alternative heating systems and insulation. Special training has been presented on heating with wood and financial management. County personnel learned new national and State trends in housing and home design at six meetings. A comprehensive resource reference of housing visuals, exhibits, teaching kits and publications was developed and distributed to county Extension personnel to help them plan and execute housing programs.

The housing specialist developed a kitchen plan for use by handicapped individuals. After kitchen planning and home maintenance and repair were identified as two areas that should receive priority, a number of publications, teaching kits and video tapes were prepared on these topics. A monthly newsletter was developed to update county housing agents.

In several counties, housing agents are cooperating with government housing authorities in on-going housing maintenance programs as part of an urban homesteading or related project.

Housing work in Piedmont counties has been coordinated with an area housing agent. Funds are needed to locate an area housing professional in the Savannah Valley and Pee Dee regions where critical housing problems exist. Continuing in-county planning meetings of Extension personnel and advisory committees are helping solve housing problems faced by South Carolinians.

**4-H and Youth Development**

At the heart of the 4-H program is the local 4-H club which acts as a learning laboratory to provide youth with opportunities to develop and strengthen their life skills. In addition, the club provides a means for 4-H members to learn more about various project areas, as well as working, playing and communicating with others. In doing so, young people can learn more about themselves.
Members are encouraged to assume responsibility for their club by working as elected officers and serving on committees utilizing the democratic process to arrive at decisions. Members are also encouraged to participate in 4-H learning activities, programs and events offered at the county and State level.

**Participation**

In 1978-79, 102,702 youth participated in programs planned, organized and conducted by Extension agents assigned responsibility for working with 4-H in South Carolina. The organized club structure accounted for the involvement of 47,482 youth. However, the club structure is only one of several delivery systems utilized by 4-H to reach various components of the youth audience. Another 17,677 were involved in short-term (generally two to 12 weeks) special interest projects. Additional contacts with youth were made through 4-H camps (5,768), special educational television programs (27,435) and the 4-H component of the Expanded Food and Nutrition Program (4,340).

**Program Emphasis**

A long-range goal and major emphasis of the 4-H program in South Carolina through 1985 is the recruitment, training and support of volunteer leaders. The utilization of skills, knowledge and experience of teens and adults to provide learning opportunities for youth is essential if the 4-H program is to continue to expand the youth audience it is currently serving. Long-range goals of 4-H include increased diversification of means used to reach youth from various backgrounds with differing needs. It is expected that volunteer leaders will play a major role in achieving this objective.

The increased emphasis on volunteer leadership is bringing about changes in the roles and responsibilities of county Extension professionals assigned to work with the 4-H program. They are emerging as “managers of resources,” working with and through local volunteer leaders to serve the needs of youth in their areas.

**4-H Camp**

Clemson University owns and operates two 4-H camps, Camp Long at Aiken and Camp Bob Cooper at Summerton. During the past year, both camps have sought and achieved accreditation by the American Camping Association.

In addition to the traditional camping program, both camps have instituted special interest weeks to encourage participation of youth from various audiences. During the past year, Camp Long
offered week-long camping sessions in electricity and dairy production. During the same period, Camp Bob Cooper offered special sessions in teen leader development, natural resource exploration and horse care and training.

By 1980 it was expected that programs at both camps would be expanded on a year-round basis. This goal has been realized at Camp Long where conference facilities to accommodate approximately 100 persons have been completed. Such efforts will enable both camps to offer additional programming for more than the approximately 5,400 campers who were served during the 1979 camping program.

**Leadership Development**

Teenage youth are a vital resource to South Carolina. The involvement of teens is perceived as a most important element in increasing substantially the involvement of volunteer leaders in the 4-H program. One goal is to involve at least 1,000 teens in district, State and national leadership training programs in 1980. In addition, efforts are being made to revise, package and distribute teen leader support materials to be used by counties in working with teen audiences.

The State office has begun implementing a five-year plan to increase teen involvement by at least 20 percent from 1,000 to 1,200 members by 1985. In addition to serving as local club volunteer leaders, county and State Extension professionals are being encouraged to involve teens more in planning statewide programs, promoting the 4-H program in the State, providing input into program development focusing on participation of older youth, and serving on planning committees for future county and State 4-H events and activities.

**Evaluation**

On the national level, the Cooperative Extension Service has conducted several studies on the means used to evaluate the effectiveness of Extension program efforts.

One result of the national studies has been increased awareness of the need for more in-depth evaluation of 4-H programming effectiveness. Thus, another long-term goal of the program in South Carolina will be to increase evaluation and research pertaining to program efforts involving youth. Subsequent research will focus on describing current program delivery structures and identifying local youth needs which 4-H may be able to serve.

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Special Programs

Scope of Activity

Extension Special Programs extends efforts to provide educational information for those with low income and limited resources. Under the broad headings of farm oriented and non-farm oriented, problems are identified and objectives established in crop and livestock production, marketing crops and livestock, food (including production) and nutrition, consumer education, youth development, housing and family life.

Small Farms Program

In the farm-oriented area, both professionals and para-professionals are developing small farms programs. Any effort to improve the status of the small farmer, caught and cramped by a technological age, must begin where he is . . . on the farm with the family. At the heart of most of his problems is the lack of real income brought about by lack of knowledge and basic farm management techniques.

Extension's educational programs and personnel are uniquely qualified to provide the small farmer with knowledge of farm planning, land preparation and fertilization, livestock and poultry management, pest control and harvesting and marketing. More time is being spent on making person-to-person contact, especially in areas with concentrations of small farms developing “small farms” programs.

The primary objectives of these efforts are to improve farm efficiency, increase family income, improve living standards and increase use of available goods and services. On-farm demonstrations have proven to be one of the best methods of dealing with specific problems with the available resources.

Pilot Programs

According to the latest available data, about three-fourths of the farms operated in South Carolina are grossing less than $20,000 annually. To meet the needs of these, a small farm task force committee composed of members from Extension, SCS, FHA, ASCS and CSA initiated combined efforts for improving services to the small farmer.

In Sumter, Williamsburg and Orangeburg counties, an area that has a concentration of small farmers, a pilot program was established by the task force committee. Each agency assigned a member of its staff the responsibility of providing small farmer assist-
ance in the areas of credit and capital, production and management, marketing, energy and quality of life.

These farmers are involved in such activities as all-practice demonstrations with crop and livestock projects. Educational information was provided through personal contact, tours, workshops and the media.
DIVISION OF REGULATORY AND PUBLIC SERVICE PROGRAMS
L. H. Senn, Director

This division of Clemson University operates several consumer protection-type programs that are closely related to the agricultural sector. The philosophy for having regulatory programs at Clemson is that certain regulations can be enforced more effectively when strong educational approaches are used. Regulatory and Public Service Division personnel use this technique as a normal procedure.

It maintains close coordination with the Cooperative Extension Service and the S. C. Agricultural Experiment Station and solicits their aid when additional educational and research efforts are needed. Strict enforcement is used only against recalcitrant offenders.

The major objective of this division is to ensure that consumers buying lime, fertilizers, pesticides and seed get the qualities indicated on tags or labels. It also enforces regulations of the Crop Pest, Bee Disease and Abandoned Orchards Acts and imposes quarantines when needed.

The division also was given the responsibility for enforcing the new South Carolina Pesticide Control Act. During 1976, the South Carolina Agricultural Liming Materials Act was passed, and enforcement responsibilities were given to the division.

The following report highlights the activities of the division during 1979-80.

**Department of Fertilizer Inspection and Analysis**


Some of the major activities of the department for the July 1, 1979 - June 30, 1980, period follow:

(1st report—final report may vary slightly)

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertilizer usage data—tons</td>
<td>813,553</td>
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<tr>
<td>No. of fertilizer samples procured and analyzed</td>
<td>6,008</td>
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<tr>
<td>No. of fertilizer samples not meeting guarantee</td>
<td>1,250</td>
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<tr>
<td>Percent of fertilizer samples not meeting guarantee</td>
<td>20.7</td>
</tr>
<tr>
<td>No. of liming materials procured and analyzed</td>
<td>296</td>
</tr>
<tr>
<td>Total number of liming materials not meeting guarantee</td>
<td>23</td>
</tr>
</tbody>
</table>

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Percent of liming materials deficient ........................................ 7.8
Total number individual deficiencies in liming material samples .......... 8
Number of irregularities other than underweight ...................... 2
Weight irregularities .......................................................... 9
Fines collected, payable to state treasurer ............................... $ 320.00
Penalties collected, payable to state treasurer ........................ $ 37,658.56
(Deficiencies where consumers not identifiable)
Fertilizer registration fees collected, payable to state treasurer .... $ 7,762.75
Lime registration fees collected, payable to state treasurer .......... $ 750.00
Lime permit fees collected, payable to state treasurer .............. $ 3,388.00
Fertilizer taxes turned over to state treasurer ....................... $198,288.11

Total monies sent to state treasurer .................................. $248,167.42

Fertilizer Movement in 1979-80

Fertilizer demand in the fall increased over the very light movement of the fall of 1978-79. This increase of 30.5 percent was mainly due to an increase in wheat acreage and use on fall vegetables in the coastal area. The prolonged rainy period in late February and March was disastrous to early fertilizer movement and to corn planting. The tonnage in March and April, usually the heaviest months of movement, was 36.6 percent and 15.1 percent respectively less tonnage than for the previous year. Farmers planted corn much later than they usually do, and fertilizer usage was greater in late April and May. The increased movement in May and June brought the total fertilizer usage to 813,553 tons, .8 percent less than the tonnage used in 1978-79.

Fertilizer Sampling

Commercial vegetable producers and peach producers requested sampling of much of the fertilizer used. Much of this fertilizer is special formulation, and the producers were anxious to determine if the fertilizer was of the quality guaranteed. Sampling opportunity was reduced because of less fertilizer moved in March and April, resulting in slightly less official samples taken during the year compared to the previous year.
Changes in the S. C. Fertilizer Law

The change in the S. C. Fertilizer Law passed by the General Assembly in 1978 has vastly increased the number of grades and ratios bought by farmers. This change allowed farmers to purchase special formulation without prior registration. It also allowed an unlimited number of ratios formulated and registered by a manufacturer. In 1978-79 there were 733 ratios sold compared to 173 ratios sold in 1975-76 before the law changes were effective.

Improvement in Quality Control

The Fertilizer Inspection and Analysis Department worked closely in 1979-80 with companies having quality control problems. Conferences were held and plants were visited. Some companies greatly improved their deficiency records. The entire State situation also reflected improvement. Whereas 28.2 percent of official fertilizer samples taken in 1978-79 were deficient in one or more elements, approximately 20.7 percent of samples were deficient or excessive in 1979-80.

Soil Amendment Regulation

On April 17, 1979, the General Assembly passed by resolution, regulations controlling the sale of soil amendments in South Carolina. In the past, materials classified as soil amendments which had questionable value have been sold in the State. Soil amendments now must be registered with the Fertilizer Inspection and Analysis Department before they can be offered for sale. The most important prerequisite for registration approval is scientific proof that the material will perform as claimed. Many of the products previously sold are not backed by this proof. Several companies applied for registration in 1979-80. No company has presented data which has been accepted to back claims; therefore, no products have been registered.

Department of Seed Certification

Seed certification is a program of standards imposed on seed and plant production that ensures varietal purity and good germination. Participation in the program is voluntary.

The Clemson University Department of Seed Certification was designated by law in 1945 as the official agency for certifying seed and plants in South Carolina. Standards of seed certifying agencies in the United States must meet standards for certification of seed in Federal Seed Act Regulations.
Field work of the department in 1979-80 involved inspections of 87,022 acres of crops, the largest acreage ever certified in South Carolina. This work included inspections of 71 varieties of 12 crops for the 364 farmers and 32 seed-producing firms participating in the program. Each field was inspected to determine that the crop was true to variety and free of noxious weeds.

Major acreages of crops inspected in the program were soybeans, 62,530; small grains, 12,108; and cotton, 10,577. The soybean acreage was an increase of almost 9,000 acres over 1978-79 and represents the largest acreage of any crop ever certified in South Carolina. The 9,098 acres of wheat were also the most ever inspected for certification in the State.

In addition to field inspection work, the department issued 1,315,730 tags for use on certified seed. In a continuing effort to monitor the quality of S. C. certified seed, 392 samples of seed were drawn by the department during the year and compared to analyses of growers' samples of the same lots of seed.

Widely varying weather during 1979-80 had considerable effect on crop yields and seed quality. Cotton experienced drought in many areas during the middle of the growing season which reduced yields. Then during late stages of maturity and the early harvest season in September, excessive rainfall caused decay and deterioration which precluded almost all of the cottonseed produced in South Carolina in 1979 from being used for seed in 1980.

The same rainfall which eliminated cottonseed in 1979 aided in producing record certified soybean seed yields and generally good quality seed for 1980.

Even though seed quality apparently suffered little, drought in May of 1980 reduced small grain seed yields. Adverse weather for producing small grains was also encountered in February and March when wet land and windy conditions limited the number of days suitable for spraying small grains for weed control.

Considerable progress was made with the problem of cowpeas in certified soybean fields. With inspectors insisting that soybean fields be free of cowpeas before approving them, more growers exerted more effort in ridding fields of cowpeas than ever before in soybean certification. Over 2,500 acres were rejected because of too many cowpeas, but the effort put forth by growers and inspectors was reflected in substantially fewer samples of certified soybeans containing cowpeas than in previous years.

The economics of producing certain crops was very evident in the demand for their seed. The demand for certified wheat seed
in the fall of 1979 was unprecedented because wheat prices were good. On the other hand, with record soybean yields in 1979, prices declined and many seed producers had to sell large quantities of seed soybeans for oil soybeans at the end of the 1980 planting season.

A major achievement in the seed certification program in 1979-80 was gaining approval by the Board of Trustees for a program of standards to provide for inspections of plants processing certified seed in South Carolina. Other seed certification standards revisions approved include provision for growing out seed samples to monitor sampling of seed by processors and growers and an increase in the number of other soybeans permitted in certified soybeans. The latter standard revision will allow producers of some of the newer, less genetically stable soybean varieties to more easily meet certification standards.

**Plant Pest Regulatory Service**

**South Carolina Pesticide Control Act**

*Registration:* A total of 556 companies registered 5,745 products in 1980. This represents an increase of 5.0 and 6.5 percent in the number of companies and products registered, respectively, from last year. The number of pesticide samples collected and analyzed was 2,010, and 68 (3.0 percent) were found deficient in the guaranteed percentage of one or more ingredients. Compared to last year, 26 percent more samples were collected with the number of deficiencies decreasing by 2.5 percent. Stop sales were issued on all deficient products. Registration fees collected totaled $94,756.25.

In accordance with the provisions of the Federal Pesticide Control Act, the department issued 27 Section 24(c), special local need registrations. One Section 18 registration was issued for ethylene dibromide (EDB) to control nematodes in soybeans.

*Certification:* Pesticide dealers and applicators must be certified and licensed in order to sell, purchase and/or apply pesticides classified for “restricted use” by the Environmental Protection Agency. In 1980, the totals of licenses issued were: private, 11,394; commercial, 1,199; noncommercial, 676; and pesticide dealers, 500. This year, for the first time, private applicators were licensed for a five-year period. The department deposited $97,793.81 in certification fees.

Each quarter, certification examinations were given throughout the State with at least three locations for each quarterly session.
Departmental personnel participated in numerous other training sessions for applicators and administered certification examinations at the end of each session.

**Education and Enforcement:** Pesticide personnel made the following personal contacts during 1980: 1,984 pesticide dealers, 391 pest control operators, 348 county agents, 187 aerial applicators, 165 noncommercial applicators, 106 commercial applicators, 83 private applicators and 42 pesticide formulators. A total of 289 structural pest inspections were conducted. In the majority of these investigations where improper or unnecessary control measures were taken, the pest control operator agreed to correct any problems and/or refund fees to the owners. However, eight informal hearings were held and numerous warning letters were issued. One pest control operator had his license suspended for one year and was assessed a $200 fine.

Seventeen investigations of potential pesticide misuse were conducted with the major problem being drift of pesticides onto nontarget areas. Two honeybee kills were investigated with pesticides found to be involved in one kill. Five fish kills in the coastal area of the State were investigated. The fish kills resulted after heavy rains from runoff from treated fields. No misuse of pesticides was involved.

Numerous "stop sale" notices were issued for unregistered products, sale of restricted use products by unlicensed dealers and other violations of the act. Overall, compliance with the act by members of the agribusiness industry has been excellent.

**The Crop Pest Act**

**Nursery Inspections:** A total of 643 nurseries, greenhouses and vegetable transplant growers and 762 nursery dealers were licensed to sell plant material, including 20 out-of-state dealers. Four hundred eighty-five (485) additional establishments were visited on routine inspections to determine compliance with quarantines and regulations and to provide assistance with pest problems. The list of "South Carolina Certified Nurseries and Dealers of Nursery Stock" compiled annually for use by department personnel and regulatory officials in other states was converted to a computerized program. The conversion is certainly more efficient and effective for program operations.

**Sweet Potato Inspections:** Sixty-two inspections, including storage, plant bed and field inspections, were conducted for 32 growers
in the Pee Dee, Sandhills and Coastal Plains areas of the State. Regular and certified seed stock was involved.

Insect and disease problems noted included flea beetle and wireworm injury, java black rot, internal cork (primarily in Chero­kee variety), surface rot on the Red Jewel variety and southern stem blight.

Additional weevils were found again this year at the USDA Vegetable Breeding Laboratory in Charleston. Measures were increased and tightened in an effort to clean up the infestation.

Two different species of ambrosia beetles were collected from sweet potatoes in Marion County. One species was native to the United States and had been reported previously in the literature from sweet potatoes. The other was an introduced species which was first reported in the United States at Summerville. It appeared that the beetles may have emerged from boxes used for packing, and damage to the potatoes was secondary.

**Phony Peach:** A total of 2,639 peach trees were found infected with this disease during the 1979 survey season as compared to 2,888 the preceding year.

**Miscellaneous Inspections:** Sixty “Phytosanitary Export Certifi­cates,” 31 state and 29 federal, were issued for agricultural planting seed, tobacco, pine pollen and plant material, primarily orchids destined to other states, Canada and foreign countries. Eighteen different foreign countries were involved. Thirty-two regular “Cer­tificates of Plant Inspection” were issued for assorted houseplants, sweet potatoes, tobacco transplants and peach budwood being moved or shipped within the United States. The major states in­volved were Florida, Texas and California.

**The Bee Disease Act**

A total of 3,466 bee colonies were inspected with only six found infected with foulbrood. Several cases of chalkbrood were also noted. Certification was issued for 1,365 colonies being moved to Florida, North Carolina, Georgia and New Hampshire.

**Cooperative State-Federal Programs**

*Imported Fire Ant:* New county records were established when fire ants were found for the first time in Oconee, Anderson, Chester and Saluda counties. In most instances, only one or two mounds were found and were treated immediately. Surveys with USDA, APHIS showed extensions in Florence, Williamsburg, Lancaster and Newberry counties.
**Gypsy Moth:** Fifty-one male moths were trapped for the season. Fifty were trapped in Horry County in campgrounds scattered along the Grand Strand, and one was collected in Georgetown County at Huntington Beach State Park. An egg mass survey was conducted again during the winter months with Plant Pest Regulatory Service, South Carolina Commission of Forestry and USDA, APHIS personnel cooperating. Results were negative. Larval trapping was also negative, so indications are that if an infestation exists, it is below a detectable level.

**Witchweed:** Sixty-seven properties totaling 1,000 acres were released from quarantine. However, infestations encompassing 2,089 acres were found on five new farms. A total of 9,409 acres received one or more herbicide applications for witchweed control for an aggregate of 27,217 acres treated.

**Noxious Weeds:** A special survey was conducted during the summer and fall under a cooperative agreement with USDA, APHIS. The survey concentrated around certain high hazard sites, and the purpose was to detect and determine if introduced or exotic weeds existed. Seven noxious weeds were found, but none that were considered introduced pests. All specimens had been reported previously in the State, but five represented new county records.
The Livestock-Poultry Health Division conducts a number of regulatory programs in the fields of consumer protection and animal health and the diagnosis of various disease problems in South Carolina livestock.

The division's three main areas of responsibility are the administration of the State Meat and Poultry Inspection Program, the Livestock Regulatory Programs and the Diagnostic Laboratory.

The Animal and Plant Health Inspection Service, USDA, cooperates with the Livestock-Poultry Health Division in carrying out certain animal disease eradication programs which are being conducted on a national basis. It also provides 50 percent of the funds for administering the South Carolina Meat and Poultry Inspection Program.

Highlights of the division's activities during 1979-80 follow.

Meat and Poultry Inspection

This department's responsibilities cover the wholesomeness of meat and poultry slaughtered and the food products processed at all processing plants in the State except for a small number of plants that operate under federal jurisdiction.

A total of 145 meat and poultry plants in 39 counties are under State inspection. The full-time staff consists of seven veterinarians, 70 inspectors, a compliance-evaluation officer and two administrative personnel. More than 100 million pounds of red meat and poultry are inspected annually in State plants.

Animal Diagnostic Laboratory

The laboratory is staffed by six veterinarians and 11 technicians. It provides diagnostic services in animal pathology, bacteriology, virology and serology for the regulatory programs as well as diagnostic help to practicing veterinarians and livestock and poultry owners in the State.

The laboratory is in a position to isolate and identify many animal diseases which are impossible to differentiate clinically. During the year the laboratory handles more than 3,000 cases and conducts more than 200,000 laboratory tests and examinations.
Cooperative Disease Eradication Programs

National disease eradication programs have been established in this country to eradicate certain livestock diseases which cause great economic losses to the livestock industry.

Our current major eradication programs are for brucellosis in cattle and swine, tuberculosis in cattle and pseudorabies in swine. South Carolina cooperates with the other states and the federal government in following uniform programs in eradicating these diseases. The federal government cooperates by furnishing approximately one-half of the personnel, equipment and indemnity funds to help carry out those uniform programs.

South Carolina was declared a Certified Brucellosis Free state in March 1972 by the U.S. Department of Agriculture.

Extensive use of two screening programs to find infected herds—Market Cattle Identification and Brucellosis Ring Test—played an important role in eradicating brucellosis from South Carolina. The programs are still being used to monitor the brucellosis situation and to help prevent the introduction of the disease in cattle imported from other states.

Livestock Auction Market Inspection

All livestock going through auction markets are inspected for contagious and infectious diseases. Ninety-four to 108 auction markets are inspected each month, and this division furnishes a veterinarian and a livestock inspector at each sale to see that all animal health requirements are complied with. In addition, a veterinarian is furnished at all dispersal and consignment sales for cattle and swine.