ANNUAL REPORT 80 - 81
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CLEMSON: LOOKING TO THE FUTURE

Clemson University is plunging headlong into the 21st century. With a total enrollment of 11,758 students in 1980, Clemson prepared to meet the demands for quality leadership and innovative education which the next century will bring.

South Carolina’s land-grant university, Clemson offers 76 undergraduate and 54 graduate programs of study in its nine academic colleges and graduate school. With a 903,000-volume library and an organized research budget of some $23 million, Clemson is prepared to further the academic horizons of its students. The 600-acre campus, with facilities valued at $195 million, is surrounded by 20,860 acres of university-owned fields and woodlands and 9,753 acres across the State which are used for agricultural and forestry research.

Every Clemson program is designed to meet the unique needs of South Carolina. The academic colleges — Agricultural Sciences, Architecture, Education, Engineering, Forest and Recreation Resources, Industrial Management and Textile Science, Liberal Arts, Nursing, and Sciences — offer a people-oriented approach to education. Emphasis is placed on strengthening students’ backgrounds in their chosen fields of study while broadening their total educational experience.

Through the Cooperative Extension Service and the S. C. Agricultural Experiment Station, Clemson reaches out to every county in the State with services which have an impact on life today and tomorrow. Extension agents in all 46 counties give the public access to experts in every aspect of agriculture and consumer affairs. Clemson is also home to South Carolina’s successful 4-H program.

With facilities near Columbia, Charleston, Florence, Blackville and Pendleton, the S. C. Agricultural Experiment Station conducts research directly related to improving production in the State’s billion-dollar farming business. Specific research includes working to find better fruits and vegetables through genetic engineering; saving precious soil, water and fuel; and answering difficult questions about obesity, hypertension, food additives and pollution.

But public service at Clemson means more than just agriculture. The University’s Continuing Engineering Education and Professional Development offices enable more than 20,000 professional men and women to keep abreast of new methods, research and developments in their fields every year.

On the academic front, incoming students continue an upward trend in standardized test scores and class ranks. Last year the average SAT (Scholastic Aptitude Test) score for the freshman class was 1005, the highest of any public school in the State — at a time when college board scores are declining nationally. About two-fifths of the 1980 freshman class ranked in the top tenth of their high school classes. More than two-thirds were in the top 20.

Through academics, research and public service, Clemson stands ready to face the challenges the next century will bring.
ACADEMICS 1980-1981

Graduate School
Arnold E. Schwartz, Dean and Assistant to the Provost

Undergraduate Studies
Jerome V. Reel, Assistant to the Provost

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
Everett L. Thomas, Acting Dean
J. Charles Jennett, Dean*

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

College of Industrial Management and Textile Science
Thomas D. Efland, Acting Dean
Ryan C. Amacher, Dean*

College of Liberal Arts
John H. Butler, Acting Dean
Robert A. Waller, Dean*

College of Nursing
Gloria A. Tanner, Acting Dean
Mary Lohr, Dean**

College of Sciences
Henry E. Vogel, Dean

* Effective July 1, 1981.
** Effective September 1, 1981.
Agricultural Instruction

Instructional programs in agriculture at Clemson continue to reflect the mandate of Thomas Green Clemson, "to afford thorough instruction in agriculture and the natural sciences connected therewith."

Agriculture today remains a dynamic field of critical importance to humankind. In recent years, its traditional role of providing food and fiber to humans and feed for domestic animals has intensified and expanded. In the face of an evergrowing human population, the need to produce more food and to reduce losses from pests and spoilage has never been greater. With intense production, concern over environmental protection has intensified. Soil erosion is the nation's leading conservation problem, but it is not widely recognized as a problem outside of agriculture. Pollution remains a concern, because it affects agriculture and in some cases is caused by agriculture. Finally, agriculture faces the same serious economic pressures faced by every industry. It is affected by the diminishing supply of skilled, available labor, and by the scarcity and high cost of fuel.

The programs in the College of Agricultural Sciences address these issues. All programs, including those in resident instruction, are integrated to serve the people of South Carolina, the South, the nation and the world. 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 in instruction:

- Instruction is principles-based and oriented toward recognizing and solving problems. This educational approach avoids excessive vocationalism and ensures a university-level education. It retains, however, the practical applications of principles which is critical to agriculture.
- Courses and curricula are constantly reviewed and revised; input from students and from nonacademic, professional agriculturalists helps ensure the most thorough, meaningful education for each student.
- Expansion of graduate programs offered through the college reflects the maturation of the college and University.
- Special educational programs are developed and presented to meet the educational needs of state agriculturalists.

In the past year curriculum reviews resulted in all courses of study being updated and modified to reflect current principles and practices. In three instances curricula and courses were totally revised. Some courses were eliminated and others were added. There are new groupings of existing courses and changes in prerequisites for many fields. Similar types of revision are still under study in three other curricula.

The first students enrolled in the extension methods minor. All curricula or departments have internship programs which will place stu-
dents in the field for practical experience. Guidelines for this program have been adopted, and uniform, college-wide administration of the programs is established. A proposal for the Ph.D. in food technology was completed, reviewed on campus and given a preliminary review by the Commission on Higher Education. The revised proposal has been resubmitted for consideration. A comprehensive evaluation of program needs in the area of integrated pest management (IPM) was also completed last year and curricular recommendations are being formulated.

Although there are still major, critical needs for equipment and facilities, significant improvements were made to teaching laboratories in Long Hall. In cooperation with the Experiment Station, renovation began on facilities for graduate student research using radioisotopes, and a microcomputer facility opened in McAdams Hall.

Fall semester 1980 enrollment — at 956 — was down from 1979; of that number 258 were regular graduate students. The pattern of the student body seems well established — 30 to 40 percent are women, and more than 50 percent have "nonfarm" backgrounds.

Growth in enrollment of new freshmen has leveled off and even declined slightly. Enrollments are sustained by students continuing to transfer to agricultural curricula in the second or third year. In some areas, agriculture as a career still suffers from a poor image. Demand for graduates remains high, however, and placement and starting salaries are competitive for students who are mobile.

Agricultural Technology Program

The College of Agricultural Sciences continues to cooperate with the State Board for Technical and Comprehensive Education and with the State Department of Education in guiding the agricultural technology programs offered at several technical colleges in the State. The college advises on curriculum development and shares facilities where feasible.

Twelve two-year programs and a single one-year certificate program are offered at eight state technical colleges. Enrollment in these programs declined to 353 in 1980-81; 126 students graduated. Some programs may have to be cut, but recruiting efforts are being intensified. Demand for graduates remains good to excellent. A new program in forest products was approved for the Orangeburg-Calhoun Technical Education Center.

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, various types of agricultural 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.

**COLLEGE OF ARCHITECTURE**

**Responsibilities**

Winston Churchill once observed that we form our buildings and then our buildings form us. In our contemporary world, this assertion may well be broadened to admit that we are very much conditioned by the total physical environment in which we live. Every human being spends the greater part of his or her life in a built environment — good or bad, beautiful or ugly. Thus, the buildings in which we work, the schools in which we learn and the churches in which we worship have a formative affect on our personalities and condition our efficiency and well-being.

All of these buildings are generally designed by architects and constructed by entrepreneur building scientists, and it logically follows that the quality of the built environment in South Carolina will closely relate to the education of those who will create it.

Clemson's College of Architecture is the only professional school in South Carolina educating potential practitioners of architecture, urban design, city planning, and building science and management. As South Carolina is expanding rapidly in population and urbanization, problems of development are becoming increasingly complex and require more than ever before the skills of well-educated teams of architects, planners and urban designers. If South Carolina is to avoid the enormous waste and ugliness resulting from haphazard and redundant growth, planning and architectural coordination will increase in importance in the years ahead.

During the past quarter century, the college has achieved a national reputation, utilizing the State as a vital laboratory for environmental design study and public service. There is no better test of any college's effectiveness than a review of the performance of its graduates a few years after graduation, measuring the success of their reception into, and performance in, the profession. Graduates of the College of Architecture are in great demand throughout this country and western Europe because of their abilities as problem-solvers in environmental design at a range of scales.

During 1980-81 the students and faculty of the College of Architecture received a number of significant national honors. For the third consecutive year, a graduate student in health care facilities planning won the National American Institute of Architects-American Hospital Association (AIA-AHA) Scholarship Award. Three professors were advanced to Fellowship in the American Institute of Architects for distinction in architectural education, design and education, and design. An
architectural studies professor became the second member of the college to be awarded an Alumni Professorship.

A Clemson student received third prize in a National Association of Collegiate Schools of Architecture Energy Study competition for integration of passive solar energy systems, as proposed by the Department of Health and Environmental Control. Another received a special citation in the 21st Annual Reynolds Aluminum Prize competition for an imaginative design for a hangar and visitors' center for the U. S. Air Force. Clemson students also received the highest award in the Washington Monument Tile Competition and a citation in the National Railroad Architects Competition for an Amtrak State Office Building.

Public Service

For the past 25 years, the College of Architecture has been actively involved in stimulating and assisting in planning and urban design studies for South Carolina communities. In the fall of 1980, postbaccalaureate students conducted an urban planning and design study of St. Matthews, S. C. The effort embraced the broader considerations in town planning and emphasized urban core redevelopment. During the same year, a group of five graduate students made an urban design and historical district redevelopment study of the city of Pendleton. This project has been approved by the Pendleton Merchants Guild and the City Council and is the basis for a phased historic renewal program.

An art and architectural history professor has been conducting systematic research in design history in Italy and was invited to read a paper at an international conference on architecture of the Renaissance at Tours, France. The Department of History and Visual Arts also served as host to a conference of the Society for Photographic Education.

A building science and management professor conducted a seminar sequence in human comfort fundamentals related to problems of architectural design for the Colorado Society of Architects. More than 70 architects of 10 states attended. He was also elected to Fellowship in the Acoustical Society of America, serves as associate editor of the Institute of Noise Control Engineering, and is a member of the board of directors of the National Council of Acoustical Consultants.

The Department of Building Science and Management has been active in professional affairs of critical importance to the building industry and, as an example, co-sponsored a seminar for construction industry personnel on "Construction Disputes — How They Arise — How To Resolve."

The Department of Planning Studies head conceived, developed and implemented a creative new program of Planning Public Service Assistantships to give graduate students professional experience and help to selected Piedmont communities. He also served as editor of "Palmetto
Activities in planning, research and public service throughout South Carolina have been vigorous in 1980-81 despite a general reduction in federal planning grants. The planning department has been involved in agricultural land preservation studies in collaboration with the Department of Agricultural Economics and Rural Sociology, and has offered numerous short courses, including a major one for local governmental officials. Planning management courses, including a growth management short course at Hilton Head, were also offered. Two planning studies professors developed a land use fiscal impact study of the management of the impact of outer continental shelf developments in the coastal region of South Carolina. A model for measuring the impact of land development was also completed.

Foreign Study and Research

By the end of the academic year, 18 groups of graduate students had studied at the Charles E. Daniel Center for Building Research and Urban Study in Genoa, Italy. The fall and spring groups of students studied alternative approaches to the redevelopment of a major north-south segment of Genoa. During the upcoming year, students will prepare a Clemson exhibit for national Italian showing. The exhibit will coordinate those sequential planning studies conducted by each of the groups in graduate residence from 1973-81. These exhibits will subsequently enable Genoa officials as well as the general public to see the outcome of these extensive studies.

COLLEGE OF EDUCATION

The academic year 1980-81 was a year of program re-evaluation to determine what changes must be made to comply with South Carolina Law 187. Committees analyzed curricula and recommended restructuring of sequences culminating in a full semester of student teaching as required by the new law.

Most departments occupied temporary facilities while Tillman Hall was being renovated. The college is expected to return to Tillman during 1981-82.

A new head of the Department of Agricultural Education was selected to replace a vacancy created by retirement.

Instruction and Teaching

The College of Education continued to improve laboratory experiences for its students. The Department of Elementary and Secondary Education had 207 placements in student teaching, 1,350 placements in
off-campus laboratory experience, and brought 290 children on campus for practicum and tutoring experiences.

Industrial education laboratories acquired new equipment, and renovation of the lower level of Godfrey Hall is planned to house two laboratories.

The Department of Agricultural Education began a new inter-college team teaching approach in selected agricultural education courses.

In-Service

The college provided both credit and non-credit in-service and staff development courses to more than 1,600 teachers and other professional educators. Ninety-four off-campus courses for university credit were taught at 36 different locations in the State.

The Department of Agricultural Education conducted 15 workshops in various parts of the State, with more than 225 teachers participating. The beginning teacher seminar in Columbia assisted first-year teachers in curriculum development.

Research and Grants

The Agricultural Education Department received grants to conduct courses to help vocational education teachers serve the needs of disadvantaged students.

The Printing Industries of the Carolinas (PICA) continued to support curriculum projects in graphic communications. Industries donated to the Industrial Education Department a diesel teaching unit valued at more than $13,000 and a color proofing system valued at $2,800.

The Department of Agricultural Education helped agricultural departments evaluate programs through a Standardized Achievement Testing Program and is developing or revising standardized tests in other agricultural fields.

Special Activities and Services

The Department of Elementary and Secondary Education continued its work with public school personnel by conducting the following special activities: Clemson Reading Conference, Staff Development Conference, Future Teacher-Scholar's Day and Salute to Education Day.

The Military Science Department hosted the Army Forces Command Band in September 1980 and the National Tactics Meet in November 1980. The department represented Clemson in national drill events at New Orleans, La., and Fort Jackson, S. C., and participated in numerous rifle matches.

The departments of Aerospace Studies and Military Science sponsored the ninth annual Tiger Drill Meet in March 1981. The event gives South Carolina high school Junior ROTC drill teams from all services the
opportunity to compete for recognition. The meet also provides recognition for Clemson University, particularly among high school students at the State and national level.

Air Force ROTC cadets visited three Air Force bases: Offutt AFB, Neb., Arnold Air Force Station, Tenn., and Pope AFB, N. C. The trips were made on USAF aircraft, giving cadets the chance to become familiar with aircraft procedures. At Offutt AFB the cadets visited the Strategic Air Command (SAC) Center and the Global Weather Center and were briefed on the Air Force’s defense systems. They also visited the SAC museum and saw vintage and modern bomber aircraft.

College faculty were involved in public service activities throughout the State. Some of the most significant contributions have been through working with the S. C. Educator Improvement Task Force. Many faculty members were involved in accreditation visits, and a number of them acted as visitation chairpersons. The faculty continue to be involved in state, local and national professional groups.

**COLLEGE OF ENGINEERING**

The College of Engineering is the focal point for engineering education for South Carolina and provides technological leadership in several ways: (1) College faculty are a resource to state government for advice and counsel, and in the recruitment of high-technology industry; (2) College faculty are an accessible engineering resource base to conduct research and solve problems for industry; and (3) College graduates strengthen state industry through the infusion of new talents and ideas.

The opportunities are limitless for the College of Engineering and its faculty to assume an increasingly important role in engineering research leadership. South Carolina — particularly the Piedmont region — is becoming increasingly attractive to high-technology industry. The demand by industry for Clemson graduates, the demand for faculty to do research, and the demand for technology transfer, through Continuing Engineering Education and consulting, places the college in a particularly attractive position to provide the key technological leadership for South Carolina.

**Instruction**

Responding to the dramatically increasing demand for computer engineering graduates, B.S. and M.S. degree programs in computer engineering were added in 1980. More than 100 students are currently enrolled, with more anticipated for fall 1981-82. In addition to computer engineering, the college offers eight other undergraduate, ten 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.
The College of Engineering is the largest academic unit on campus. Fall 1980 enrollment was at an all-time high of 2,748 students, of which, 2,504 are undergraduates and 244 are graduate students. A total of 338, or 12.3 percent, are women. For 1980-81, 390 baccalaureate degrees were awarded in addition to 71 master's and 4 doctorate degrees.

An increasingly important educational component is the Cooperative Education program. Approximately 300 engineering undergraduates represent about 85 percent of all students participating in this program. Cooperative Education is a voluntary program and consists of a minimum of three semesters of work periods in industry alternating with semesters of full-time study. The program provides students with challenging, planned work experiences related to their college curriculum. In addition, the contact with about 200 Southeastern organizations brings the College of Engineering closer to engineering in industry.

The demand for engineers at all levels remains very strong. This has caused shortages at the faculty level and created strong competition among companies for B.S. graduates. Salaries are at record highs. The average 1981 Clemson engineering graduate had more than three job offers and began his career earning about $22,800 per year.

The demand for women and minority engineers continues to increase. To meet these challenges, the college has set a goal of increasing minority enrollment by 5 percent a year through the 1980s. Activities directed to increase minority enrollment are detailed in the Public Service section of this report.

The summer Master of Engineering program has been expanded to include both summer sessions. These programs are fully funded by the Western Electric Co. in one case and the U.S. Air Force in the other. Participants obtain their Master of Engineering degree after five summers of classes at Clemson. The Department of Electrical and Computer Engineering will expand this program to have a maximum of 35 engineers attending each session.

The Department of Chemical Engineering is embarking on three innovative project areas. The first is a long-range program to upgrade capabilities for teaching and research in process automation. Industry, the U.S. government and Clemson University will provide equal funding each year. Two other programs, the Master of Science Industrial Residency program and the Industrial Graduate Fellowship program, are being used as models for other programs in the college. They will strengthen graduate programs and research by increasing enrollment at the doctoral level through funding from industry.

Engineering technologists have established a program with Duke Power Co. to provide education for senior reactor operators at the Oconee Nuclear Station. The program will provide the required education for the shift technical adviser position, and may become the basis for a nuclear engineering technology specialty within the department.
The Clemson University Upper Division at Greenville TEC is based on the premise that the Greenville area, with its growing industrial community, includes a number of potential students with technical or engineering interests. Beginning in fall 1981, courses will be offered at TEC leading to the B.S. degree in computer science, electrical, mechanical and computer engineering, and engineering technology.

Research

Research activity in the college continues to produce record figures. Total expenditures for research during 1980-81 rose to approximately $3.1 million on 96 active projects. This money was obtained from government agencies and industrial sponsors under highly competitive conditions, and is a tribute to the faculty’s professional capabilities and performance. The dollar volume of new research awards was $3.7 million. Ninety faculty were engaged in research during 1980-81. Their efforts were supported by more than 100 graduate and 45 undergraduate students. Total research grants-in-force, including multi-year contracts, exceeded the $7.4 million mark.

Engineering research at Clemson has three essential objectives: to seek new knowledge, to seek answers to both the short- and long-term technical problems of the State and nation, and to support advanced-level educational programs by providing research experience for students.

A major research award for 1980-81 was three component proposals of the South Carolina NSF Experimental Program to Stimulate Competitive Research (EPSCOR). Funds allocated to the college, coupled with cost-sharing funds, will develop nationally competitive faculty in these areas. Specifically:

- A grant of $54,800 (part of a three-year $151,500 grant) enables Clemson bioengineers to study bone strength in a variety of animals and man. This research promotes more accurate studies of the musculoskeletal system for the fields of orthopedics, aging and child development.

- Environmental systems engineers are developing 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 including the EPSCOR program, support this new research area.

- Mechanical engineers, funded for five years at $500,000, will develop a research capability in heat transfer and mass transfer.

A partial list of other projects active during the year gives an indication of the scope and breadth of engineering research at Clemson.

Clemson’s chemical engineers are teamed with engineers from the University of Oklahoma in research to develop theories for properties of
liquids. This $95,000 project is funded by the National Science Foundation.

Civil engineers are evaluating the effectiveness of steel studs to support brick walls in a $42,000 project jointly sponsored by the Metal Lath/Steel Framing Association and the Brick Institute of America. This experimental and theoretical project will help solve design problems previously associated with the system.

The Clemson Hydraulics Laboratory, operated by the Department of Civil Engineering, has recently completed a second large modeling basin. The new basin is 50 by 70 feet and is equipped with a 30-foot wave generator. Completion of this facility expands the hydraulics lab to one of the largest modeling laboratories in the Southeast.

A study of the potential effects of acid rain on the aquatic environment of the Southeastern United States is being conducted by environmental systems engineers in a $93,000 project supported by the Water Resources Research Institute.

A research effort has been initiated by Clemson's engineering technologists with Tungsten Industries in Greenville to study the further automation — computer numerical control (CNC) — of their burr-grinding machines. The concept of CNC grinders is a relatively new idea in the industry, and the particular techniques being developed under this contract will be one of a kind.

Systems engineers are developing a unified data base of human resource information which can be used to design weapon systems with lower operating costs. This $1.5 million project is funded by the United States Air Force and Lockheed-Georgia Co.

Electrical engineers are studying the fabrication and properties of very small transistors. This project has more than $150,000 in research support from the Office of Naval Research, the Rome Air Development Command, and the Naval Research Labs.

Solar cell reliability research is continuing in the Department of Electrical and Computer Engineering with an expenditure of approximately $400,600 sponsored by the Department of Energy.

Ceramic engineers have developed special coatings for brick that make them more effective solar energy collectors. A series of test rooms has been built to get design information on the Clemson coatings and other aspects of passive solar design. This $70,000 project is funded by the Department of Energy and the Brick Institute of America.

Several college faculty received special recognition for their accomplishments. Chemical engineer James M. Haile won the fifth annual McQueen Quattlebaum Faculty Achievement Award for research contributions in computer simulation of fluids. Environmental systems engineer T.M. Keinath traveled to Munich, Germany, for the International Conference of Water Pollution Research. Civil engineer J.C.
McCormac was named Alumni Professor of Civil Engineering. And civil engineer Subhash C. Anand visited Uruguay as a Fulbright Lecturer.

**Public Service**

A 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 State’s economy. During the past year engineering faculty served 8,122 people through CEE courses, seminars, workshops and symposia which represented a total commitment of 787 program-days, making the Clemson program the largest in the State and one of the major ones in the nation.

Major conferences included a three-day Fiber Producer Conference and Exhibition attended by more than 1,400; a three-day Plant Operators Forum for manufacturers of ceramic products attended by 374; a two-day conference on the design of passive solar homes attended by 284; and a two-day conference on toxic chemicals in water with participation by 65. The 11th Annual Conference for Engineers of the South Carolina Department of Highways and Public Transportation was attended by 109.

The annual series of Reviews and Updates was taught in five cities and included 30 subjects of interest to practicing engineers. More than 650 engineers participated in an average of more than five classes each.

Other short courses and workshops representative of the 354 CEE programs conducted are boiler efficiency workshops for industry, short courses on soil and site improvement, computer graphics, productivity improvement for industry, small computer applications for industry, and microprocessor applications.

The fourth year of the summer engineering program for minority high school students continued that program’s record of success. More than 300 qualified students have attended these programs which are supported completely by industry and foundations. Of the 60 who inaugurated the program in 1978, 52 have enrolled in college and at least 39 are studying engineering. The 23 who have enrolled in Clemson have now successfully completed their freshman year and are performing at the same academic level as the overall student body.
The Department of Forestry and the Department of Recreation and Park Administration make up the College of Forest and Recreation Resources. The college offers the only teaching, research and public service programs in South Carolina in the fields of forestry, wood utilization, and recreation and park administration. The college is dedicated to promoting the wise management, use and stewardship of the State's forest resources and enhancing the quality of life of its people through rewarding use of leisure.

The Energy and Resource Development Institute (ERDI) began active work in February 1981 under the auspices of the college. The Institute's mission is to initiate research in the areas of conservation, management and development of energy resources in the Southeast.

Department of Forestry

As the only university in South Carolina with a forestry department, Clemson has the unique opportunity to supply the foresters who manage the 12.5 million acres of forest land in this State. In fact, more than 50 percent of the graduates to date have stayed in South Carolina to meet this objective. Clemson's curricula emphasize the role of wood as a basic forestry resource. They provide for study in the area of wood utilization or in forest management. Undergraduate studies are augmented by Master of Science and Master of Forestry programs.

Teaching

During the academic year, 30 candidates received the Bachelor of Science degree; 25 graduated from the forest management program and five from the wood utilization program. Ten graduate degrees were awarded: seven Master of Forestry degrees and three Masters of Science.

For the second straight year, faculty concentrated its recruiting efforts by informing guidance counselors and prospective high school students about careers in forestry and the program at Clemson. Public and private schools were visited throughout the State. The drive culminated with the second annual forestry weekend held in May for prospective forestry students. Twenty-two students from all over South Carolina attended to see the facilities and hear about programs.

The Ph.D. program in forestry was forwarded and approved by the Graduate Council of the University. It is now pending approval by the South Carolina Commission on Higher Education and is expected to begin in January 1982.

Following the success of last year, summer camp for Clemson and University of Tennessee forestry students was jointly conducted at
Clemson for one week. This effort was again highly successful and gave students from both schools an opportunity to accomplish mutual objectives.

Research

The research programs in the Forestry Department are carried out cooperatively by four teams.

The Timber Production Research Team is composed of scientists in forest soils, silviculture, entomology, genetics, pathology and tree physiology concerned with problems preventing full timber productivity.

Approximately 25 state and federally funded projects are ongoing in this area. Two grants, each funded at $50,000 for one year, were completed this year. The first, from the Appalachian Regional Commission, determined how much forest biomass is presently available for power production in Appalachian South Carolina. The second grant was used to develop models for ranking stand susceptibility to southern pine beetle infestations in the Southern Appalachians.

The team also received outside funding for new areas of research. E. I. Dupont De Nemours and Company funded two projects: $37,743 for the investigation of irrigation of a loblolly pine stand and mixed hardwood stand using digested secondary wastewater treatment plant sludge, and $46,712 for investigation of irrigation of a loblolly pine stand using fiber process sludge.

The Integrated Pest Management Program under USDA funded three projects at more than $70,000, and other grants were received from the Southeastern Forest Experiment Station. Funding also continued from the Georgia Forestry Commission.

Scientists in the timber production area gave numerous presentations and completed publications on their work. One publication was "Yellow-Poplar—An Annotated Bibliography," a compendium of all known references through 1974. Its editor received the distinguished Oberly Award for Bibliography in the Agricultural Sciences by the Science and Technology Section of the Association of College and Research Libraries, American Libraries Association.

The Forest Management Research Team seeks solutions to forest-based, multiple-use problems. A sampling of the team’s contributions to this mission follows:

— Continued implementation of the Management Alternatives Research Program (MARP) to provide forest managers with an assessment of management techniques applied to forest lands managed for wood production, multiple-use or protection.

— Continued work on the landowner characteristics and external factors affecting participation in private forest management incentive programs in South Carolina.
— Began work on a research problem analysis in forest wildlife management to determine critical areas of research for the State.

— Began work on a study of natural succession in the Clemson Experimental Forest and vegetation and species patterns with respect to soil and site conditions within the South Carolina Piedmont hardwood forests.

The Wood Utilization Research Team continued work on state and federally supported projects dealing with cardboard mulches as a vegetation control in Christmas tree plantations, and presteaming of green, air-dried oak lumber. New studies were begun to determine household firewood consumption in the State, to develop a standard procedure for rapid determination of moisture content of wood fuel, and to measure moisture weight loss of loblolly pine trees stored with their crowns intact. Work continued on a grant from the U.S. Forest Service to create whole tree weight and volume tables for the commercial timber species of the United States.

The Biological Productivity Team at the Belle W. Baruch Forest Science Institute in Georgetown continued more than 20 projects dealing with coastal plain wildlife, hydrology and ecology. New projects were begun to determine the spatial distribution of loblolly and longleaf pine stems on Hobcaw Barony; inbreeding depression in selected populations of loblolly pine; and changes in water quality associated with lowland forest site conversion.

The U.S. Forest Service funded new projects dealing with deer forage nutritional values, loblolly pine root physiology, and soil water level effects on the survival and growth of various species. Support continued for research on the Red-cockaded woodpecker, and the National Park Service renewed support for the study of feral ungulates on Shackleford Island, N.C.

Seven papers by Institute faculty members were published or accepted for publication during the year. In April the Institute sponsored a symposium on the Effects of Prescribed Fire on Wildlife with 100 participants. Approximately 2,000 visitors toured Hobcaw.

Extension

The publication "Forestry As An Investment: How to Compare Planted Pines to Other Investments" has been very well received and is being used by several consulting forestry firms and forest industries as a routine part of their management activities with their landowner clientele.

An updated version of the County Forestry Fact Sheets acquaints people with the importance of forestry to the economic welfare of the country and shows opportunities for continued development of this resource. The publication can also be used by local planning groups and development boards to recruit forest industry into their area.
Many landowners are expressing interest in growing Christmas trees as a crop. A new publication provides specific information on the amount of time and the cost involved. As the number of growers increases, special courses are being designed to address this audience. During the year a statewide workshop series was held specifically for Christmas tree growers, and more than 100 growers attended.

Two new reports were developed for the South Carolina Economic Report and South Carolina Statistical Abstracts. Reports will be prepared on an annual basis for inclusion in these publications.

A new directory of forest industries in South Carolina has been prepared in cooperation with the South Carolina Forestry Commission. Lists of buyers have also been prepared.

**Department of Recreation and Park Administration**

**Teaching**

The faculty have continued their commitment to improve teaching, placement of graduates and recruitment materials.

The graduate program was accredited for a five-year period by the NRPA Council on Accreditation. All of the department’s programs are now so recognized.

During 1980-81, 100 undergraduate degrees were awarded, and eight individuals received the Master of Recreation and Park Administration degree.

**Research**

The department’s research program received a blow when the U. S. Forest Service decided to discontinue funding the Forest Recreation Research Unit. Another funding source is being sought to continue the outdoor recreation research program.

Even with reduced funding, the faculty generated 35 publications, delivered 14 addresses to professional and learned societies and have 13 papers in various stages of preparation.

Cooperative research has continued with the Recreation Division of the S. C. Department of Parks, Recreation and Tourism. Efforts will be expanded as the Energy Resource Development Institute hits full stride.

**Extension**

Two continuing education workshops were continued — the executive development program for the U. S. Army Corps of Engineers and the resource management program for the U. S. Forest Service.

The community recreation Extension specialist developed a recreation energy management workshop in conjunction with the U. S. Department of Interior’s Heritage Conservation and Recreation Service.
A resource management training program has been developed for the fall of 1981 under contract with the National Park Service. Program planning for a regional training program will be offered during the 1981-82 year in the area of therapeutic recreation.

The department's camping program was highlighted by the completion of the first phase of the third and final sub-camp, Camp Sertoma. Four cabins of an eventual eight-cabin complex were completed to serve campers in the summer and other user groups during non-summer months.

Residential summer camping opportunities for special populations in South Carolina were available at the Outdoor Laboratory. Programs staffed by college students from Clemson University and other colleges and universities served children, teens and adults with mental retardation; children with hemophilia, visual problems, and speech and hearing handicaps; disadvantaged youth; children afflicted by diabetes; and young people with emotional difficulties. Senior Adventure Camp for South Carolina's elder citizens was held at the laboratory during September, and College Week for Senior Citizens served 500 residential and day students in May.

Non-summer demand for facility use expanded greatly during the past year. More than 130 different clubs, organizations or academic disciplines were served from September 1 - May 30.

Planning efforts this past year included technical assistance to almost 25 South Carolina communities.

The projects included: assistance in Heritage Conservation and Recreation Service and other grant applications; site design requests; examination of county park growth; master land use plans; interpretative plans; cooperative programming; reviews of master facility plans; Urban Park and Recreation Recovery Act grant reviews; advice on departmental structuring; preparing historic site brochures; providing public tours of local historic sites; developing and promoting the local Fort Rutledge Historic site; consulting with local Y.M.C.A. representatives for a swimming area feasibility study; assessment of residents on the need for more bicycle paths in Clemson; and coordinating the area Special Olympics for handicapped children.

**Energy and Resource Development Institute**

The Energy and Resource Development Institute (ERDI), a division of the College of Forest and Recreation Resources, began active work in February 1981. The Institute initiates research in the areas of energy conservation, resource management and development as it pertains to energy, and socioeconomic impacts of energy availability and policy.

ERDI's focus is regional. The Institute was formed on the premise that energy problems are regional rather than local; thus, solutions must also be regional. To pursue this approach, the Institute is affiliated with
the Southern Appalachian Research/Resource Management Cooperative (SARRMC). This affiliation gives access to the best scientists in the Southeastern United States and allows for the transfer of research findings and technologies. The Institute operates through cooperative arrangements with regional scientists and relies on shared expertise for growth rather than building an "in-house staff."

ERDI operations are underwritten by a three-year contract with the U. S. Forest Service. In addition to initial operating funds of approximately $45,000 annually, a supplemental contract for $50,000 has been developed. A portion of these supplemental monies, $27,000, has been designated to develop a five-year energy research agenda for the Southeastern United States. The remaining $23,000 is allocated to develop research program assessments in the following areas:

- Development of low altitude thermal scanner application for assessing the contribution vegetation has for structural energy conservation.
- Assessing energy budgets for evaluation of resource management and development plans.
- Assessing resource valuation by integrating net energy cost into benefit/cost calculations.
- Application of a cross-impact assessment process to establish regional energy research needs.
- Development of a methodology for assessing tourist market changes which have occurred or may occur as a result of fuel price and availability.
- Development of an energy index, from existing and recurring reported indicators, to project impacts from regional resource availability.

A specific ERDI project, begun during spring/summer 1981 under the energy conservation program area, is a housing energy research project. The program has a tripartite arrangement between the Clemson University Foundation Inc., ERDI, and the USDA-SEA-Rural Housing Research program. ERDI members include the University of Georgia, U. S. Forest Service, and Clemson University's College of Forest and Recreation Resources. The project involves construction of a series of homes to assess energy conservation techniques, materials, and site preparations. The program will run for approximately five years and involve the construction of four to six homes. At the conclusion of the research the homes will be sold. Proceeds will go to the Clemson University Foundation Inc. to underwrite future ERDI programs and operations.

Publications included three scientific articles in scholarly journals, one textbook chapter and one agency report. Two papers were presented at professional association meetings, and numerous lectures were given to university classes and community and business groups.
The arrival at the end of the 1980-81 fiscal year of a new dean, Dr. Ryan Amacher, a widely-known economist, coincides with completion of a $4.5 million renovation of Sirrine Hall. The renovation marks the end of 43 months of actual physical work to create a modern and effective home for the College of Industrial Management and Textile Science. During the time required for planning and execution of the work, the faculty and student body grew in sufficient numbers to completely utilize the space provided.

Two self-studies were made in the college. A general 10-year study to seek continuing accreditation with the Southern Association of Colleges and Schools for the entire college was completed. It shows the college to be in good health and progressing. Visitation committees will study the report and visit in fall 1981 to determine continuing accreditation.

The second study, made for the American Assembly of Collegiate Schools of Business, determines if graduate programs in the business area can be accredited. It too shows the progress in management and accounting to be healthy, and visitation by an outside accreditation committee will be accomplished in fall 1981.

The college continues to grow in numbers of students majoring in its 14 curricula. In fall 1980, 2,428 undergraduates were enrolled — more than one-fourth of the undergraduates at Clemson. The graduate programs included 89 master's and Ph.D. students.

The total perspective of the college is best shown through a description of its four teaching departments and Office of Professional Development.

Department of Accounting and Finance

Student demand continued strong for the department's degree programs and courses, reflected by increased enrollment trends. During the year, the number of majors in the B.S. degree program in accounting was 364, with 542 majors in the B.S. degree program in financial management. The total of 906 majors was up from 829 the previous year. More than 2,500 students registered per semester for accounting and finance course work.

In spring 1981 additional faculty positions were authorized for the department for which recruiting efforts are continuing into the new academic year. The qualifications of the faculty improved by the employment of six new members, four of whom have doctoral degrees. The other two are expected to receive their doctoral degrees in August and December of 1981. None of the five faculty members who terminated employment with the department during the year had doctoral qualifications.
Toward the end of 1980-81 the department occupied newly renovated office space in Sirrine Hall and will fully utilize all of its allocated office and classroom space. The department has been at a competitive disadvantage in the marketplace for both new faculty and on-board faculty but views the future with good prospects for better salaries.

Prof. C. C. Davis, who had served as department head since its creation in 1974, returned to the status of tenured professor of accounting and finance July 1, 1981. He was succeeded by Dr. James R. Davis, who received his doctorate at Georgia State University and had been actively involved in teaching, research and public service at Auburn University.

Department of Economics

The year was the most productive one in the Department of Economics' brief history. Record levels were reached in numbers of students taught, scholarly articles published, undergraduate economics majors, and the national recognition bestowed by the community of scholars. The Department of Economics continued to play an integral role in providing a quality education for both Clemson students and the citizens of South Carolina through numerous public service projects.

For the fifth consecutive year, enrollment in economics courses increased by more than 10 percent and now exceeds 2,600 students a semester. Forecasts are for continued growth in economics. With this growth, the department hopes to expand the number of upper division options available to both undergraduate and graduate majors.

The year was highlighted by a $1 million gift from the Abney Foundation to establish the Abney Chair of Free Enterprise, first of its kind in South Carolina. The search for a recipient for this chair will continue throughout most of the 1981-82 academic year. The Abney Chair holder will enhance the reputation of the Department of Economics by being a nationally recognized scholar, lecturer and educator. This person will also assist the Center for Economic Education in its work to improve the economic literacy level of the State's children.

The economics faculty continue to produce a voluminous amount of scholarly research. The quantitative summary of this year's research is four books, five monographs, four completed grants, 60 articles in refereed professional journals and 12 papers presented at professional meetings. In addition to the completed research, ongoing research continues in many areas. Five manuscripts are presently under consideration as well as countless articles under review at professional journals.

Research not only improves the level of instruction but provides an opportunity for Clemson scholars to communicate their views to people outside the University and influence economic policy both at the State and national levels.
With the financial support of the J. E. Sirrine Textile Foundation, the Center for Economic Education continued to provide educational opportunities to the State’s citizens. Through graduate economics courses for teachers, workshops and in-service programs, the department has improved the level of economics being offered in the public school system. Furthermore, the economics faculty gave more than 100 speeches to civic clubs and professional organizations throughout the United States.

In this election year, economic issues occupied the “center stage” of attention. The Economics Department, through numerous television, radio and newspaper interviews, made a sincere attempt to explain the economic consequences of alternative public policies put forth by competing candidates at various governmental levels.

Several economists received national recognition. One professor not only authored three books, but also received the Freedom Foundation’s national award for Excellence in Economic Education. This was the second consecutive year a Clemson economist has won this prestigious honor. Another served as a referee for several journals, was a member of Governor Richard Riley’s ad hoc committee on productivity, and testified before the U. S. Senate Judiciary Committee. A Clemson economist agreed to write an international trade textbook and also developed a macroeconomic index for college teachers for “The Wall Street Journal.” One professor was elected to the Board of Directors of the S. C. Council of Economic Education and served as director of the Center for Economic Education. Yet another was elected by his peers to be an executive officer of the Southern Economic Association.

This past year has been a year of committees. At least five economists served as chairmen of various self-study committees either for the Southern Association or for AACSB accreditations. Economic faculty members also served on search committees for deans and on new committees created by the restructuring of the University tenure and promotion procedures.

The year marked another milestone in the history of the department. We celebrated the tenth anniversary of the “Economics Today” weekly newspaper column which now appears in 26 newspapers in the Southeast. In addition, faculty members have written columns for the “Textile Marketing Letter” and quarterly reports in the “Marketplace” newsletter published by the Center for Economic Education.

Department of Industrial Management

Traditionally the Department of Industrial Management has emphasized maintaining quality programs and providing excellence in teaching. Although excellence in teaching is our main priority, research, consulting and public service also continue to be important goals with
the faculty. This group has published and/or presented 60 papers and provided aid to numerous firms during the past year.

Enrollment in the six degree programs administered by the department continued at about the same level, with some increase in the undergraduate programs. The M.S. program in management is up for AACSB accreditation in 1981-82, and the administrative management and industrial management curricula are scheduled for reaccreditation at the same time.

Number of majors by categories:

- Undergraduate: 1,281
- Graduate Resident: 50
- Clemson/Furman MBA: 179
- TOTAL: 1,510

Degrees awarded by type:

- Bachelor of Science: 223
- Master of Science: 9
- Master of Business Administration: 38
- Doctor of Philosophy: 3
- TOTAL: 270

Our graduates are highly recruited for employment by both regional and national firms. A large number find employment in the production and marketing areas for which our programs prepare them well. However, they are by no means limited to these areas since they are also prepared to work in areas such 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.

**Department of Textiles**

The Textile Department made major advances in achieving teaching, research and service progress. The most significant aid to this progress was the completion of laboratory, classroom and office renovation. Presently Sirrine Hall is an outstanding physical complex, and its textile laboratory concept should be considered among the finest in the world. A major challenge remains, however. These unique laboratories need to be upgraded in their equipment holdings so that within Sirrine Hall any fiber material can be made into a useful textile structure, any fiber-forming polymer can be made into yarn, any useful resinous material or compound can be made into a textile auxiliary, and all phases of these conversion processes can be quantitatively analyzed. With outstanding facilities, exceptional programs evolve; highly talented and creative
teachers and learners are attracted to such exceptional programs; textile leaders and advanced technology of the 21st century will come from such an environment.

Research achievements include the completion and expansion of projects for both industry and government, as well as traditional thesis, dissertation and individual faculty laboratory work. Research results have been published in textile and scientific journals as well as textbooks. New and expanded research areas include experimentation with advanced technology fibers such as carbon and graphite, yarn formation mechanics and analysis, novel spinning modifications, foam sizing of warp yarns, nonwoven fabric development, fabric flammability analysis, foam dyeing, standardization methods for the use of colorimetric equipment in military inspection, and energy efficiency of textile manufacturing processes.

Services rendered to the textile industry and public have expanded as the Textile Department has become increasingly recognized as a technical resource base for textile information and expertise. Textile faculty are in daily contact with industry representatives and provide answers to questions as basic as material identification and as complex as coping with technological change. Short-term service projects have been undertaken and completed at an average frequency of one to two per week. Examples of such work include physical testing of fibers, yarns and fabrics; chemical analysis of manufacturing additives; spinning a novel fiber into yarn; designing and weaving a unique fabric for medical research; counseling industry and government on color technology; and providing opinions on technological progress. In addition, textile faculty continue to provide leadership for technical symposia, professional societies, industry associations and technical publications.

Professional Development

About 4,000 women and men representing more than 1,000 different companies enrolled in 168 professional development courses during the year. Participants attended textile courses which ranged from the “Fundamentals of Textiles” to “A Color Science Tutorial”; attended management courses which ranged from “Professional Development for Secretaries” to “Productivity Improvement Strategies for Executives”; attended accounting and finance courses which ranged from the “Fundamentals of Finance and Accounting for the Non-Financial Manager” to “Corporate Cash Management”; and attended economics courses which ranged from “The Merits of the Free Market System” to an “Economic Outlook Conference for 1981.”

In addition to participating in public courses, many participants requested that in-house executive development programs be developed exclusively for their companies. During 1980-81, 480 participants attended 24 in-house courses developed for such companies as J. E.
Sirrine, Celanese, Exxon, Southern Security, Westvaco, Badische, Colesium Park Hospital and DuPont.

In addition to support received from participants in various courses, the Professional Development Office was honored in several other ways. The office accepted on behalf of the University a silver bowl awarded by the South Carolina Association of Higher Continuing Education for excellence in overall continuing education programs. The recipient was decided by a vote of the association's 125 members representing two- and four-year colleges, TEC schools, and private and state universities.

Also during the year, two international textile organizations — the European Seminar Group (ESG) and the International Council for Textile Technologists (ICTT) — selected the Professional Development Office to host the first "World Conference on Warp Sizing" to be held in the United States. The International Conference will be held in May 1982, and is expected to bring to Clemson more than 400 textile scientists, administrators and engineers from around the globe.

The director of the Office of Professional Development was selected by the president of Clemson University to chair a special committee formed to propose ways Clemson and the State's TEC system might work more closely together to improve cooperation in continuing education. Ten recommendations along with supporting materials were included in the report developed by the committee, and a presentation was given to the TEC presidents at a summer meeting at Fripp Island.

Small Business Development Center

The Small Business Development Center of South Carolina is a consortium of four universities in the State. During the year the regional center at Clemson conducted 25 continuing education courses for small-business persons. Each course addressed the basic needs of small business such as accounting and payroll procedures, inventory control, cost reduction and computer management. In addition, more than 140 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 and consulting for small business persons was handled by graduate students and faculty members from the College of Industrial Management and Textile Science.
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 annually draws hundreds of participants from several states. The department also conducts a foreign study program in France.

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 Symphonic 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.

“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 1980-81 the Languages Department hosted the convention of the Mountain Interstate Foreign Language Conference (MIFLC), the History Department co-sponsored an extremely successful conference titled "Sports and Society," and the College of Liberal Arts Lecture Series dealt with "Liberty and the Limits of the Law."

**COLLEGE OF NURSING**

In July 1980 Geraldine Labecki retired after 12 years as dean of the College of Nursing. After a national search, Mary Lohr, R.N., Ed.D., was appointed dean of the college effective September 1, 1981. Dr. Lohr comes from the University of Michigan where she served as dean.

The College of Nursing continues to develop and expand its programs. A project director was appointed for the Nursing Center housed in the College of Nursing building. The center provides a clinical site for teaching students the practice of nursing. An important adjunct to the Nursing Center is the nursing service provided to people in the community. Clients are seen by faculty and students in the center on a one-to-one basis, in groups, and are visited in their homes. The types of health-related activities of the center include promoting health and wellness; preventing illness; learning about normal growth and development; learning to cope with a health problem such as high blood pressure, cancer or stroke; well-child care; and infant stimulation.
Undergraduate Programs

Baccalaureate Degree Program
During 1980-81, 108 new students were enrolled in the Baccalaureate Degree Program; 56 received the Bachelor of Science in nursing degree in May.

The faculty were engaged in two self-study reports for accreditation by the Southern Association of Colleges and Schools and the National League for Nursing. These studies required a complete review of the philosophy, purpose, objectives and conceptual framework of the college. A curriculum consultant visited the campus in February.

There was a regional Sigma Theta Tau meeting hosted by the Gamma Mu Chapter. Two faculty members presented their research findings at “An Evening of Research,” presented by the Gamma Mu Chapter of Sigma Theta Tau.

Another faculty member prepared a proposal for a clinical unit (oncology nursing) for the Nursing Center and initiated a student-faculty program, in connection with a senior nursing elective, that was attended by nurses from three South Carolina hospitals.

The director of the baccalaureate program was elected to the South Carolina Nurses’ Association Council on Education.

Associate Degree Program
The Associate Degree Nursing Program enrolled 41 students during 1980-81. Twenty-seven students were awarded the Associate in Arts degree in nursing in May.

The Associate Degree Program will be phased out effective July 1, 1982. The Board of Review for Associate Degree Programs, National League for Nursing, has extended accreditation status to the program through June of 1982.

Graduates of the program are predominantly employed as staff nurses in community hospitals, primarily within counties adjacent to the University.

Graduate Program
Five students were admitted to the graduate program during 1980-81, four students continued course work, and four students were engaged in thesis research. The Master of Science degree was awarded to five graduates.

Faculty completed a review of the degree program as a part of the accreditation process. In April the program was reviewed by the Health Education Authority of the South Carolina Commission on Higher Education. Faculty attended state, regional and national meetings. Two members served on accreditation teams for the Southern Association of
Colleges and Schools. One member of the faculty served as an accreditation visitor for the National League for Nursing.

The program received $28,380 as a professional nurse traineeship award. This award provided tuition, fees and a stipend for eight students.

Department of Continuing Education

In its fourth year of operation, the Continuing Education Program served more than 600 people through 29 workshops, conferences and noncredit short courses.

The majority of the offerings were designed to recognize the variety of educational and practice backgrounds within the nursing occupation. Community service offerings were conducted on cardiopulmonary resuscitation and enabled 36 members of the community to be certified by the American Heart Association in basic life support.

The final sessions of the videotape series on community health nursing, developed under contract with the South Carolina Department of Health and Environmental Control (DHEC), were aired over the Health Communications Network to 22 viewing sites across the State. This unique series was designed so that 101 of the staff nurses employed by DHEC and enrolled in the series worked closely with their public health nursing supervisors in completing assignments related to the videotape content. Marketing strategies have been initiated for wider distribution of the copyrighted series.

An intensive five-day review series prepared recent graduates of baccalaureate degrees and associate degree nursing programs to take the State Board Test Pool Examination for Registered Nurse Licensure.

Another major offering was the fourth annual post-doctoral conference on theory development in nursing. Participants and presenters from 13 states within the Southwest, Southeast, North Central, Mid-Atlantic and Northeast regions discussed recent advances in nursing theory.

Department of Nursing Research

Faculty are continuing to be productive in nursing research. Ongoing research related to the care of clients with cancer, coping and stress in clients with hypertension, and relaxation and test-taking in students.

COLLEGE OF SCIENCES

The 1980-81 year brought approval of two new degrees: Bachelor of Arts in zoology and Doctor of Philosophy in microbiology.

The number of majors in scientific disciplines has remained fairly 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 con-
continues to expand each year beyond expectation. 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.

Faculty in the College of Sciences have more than $4 million in contract funds to support research from both federal agencies and industry and this year negotiated the largest industrial grant to the University to date: approximately $500,000 from Diamond-Shamrock Corp. Many are active in national scientific societies with several being officers. Several traveled to other countries to give invited lectures and papers and attended invited conferences.

**Department of Biochemistry**

The Bachelor of Science degree program enrolled 50 students, and 17 pursued graduate degrees in biochemistry. More than 600 students were enrolled in biochemistry courses. Two M.S. and 16 B.S. degrees were awarded.

Five outside research grants were held by faculty members. Two were from the National Institutes of Health, and one each from the American Heart Association, Research Corporation and Sigma Delta Epsilon Graduate Women in Science. Grants in force totaled nearly $300,000. Projects included research dealing with complement and cellular energy regulation.

Faculty presented nine papers at national meetings and 12 at regional meetings, published four manuscripts, and gave 18 invited seminars off campus.

**Department of Botany**

The year was a productive one for the Botany Department.

Research goes on in the Arctic to determine the effect of worldwide carbon dioxide concentrations on the Arctic tundra. A lazer has been constructed by the department and is used for measurement of minute plant growth increments. A survey of the planned Russell Lake area on the Savannah River continues. Investigations of the life cycle of the major aquatic plant pests in this state are reaching a conclusion. New research effort is going into cloning and tissue culture. Chemotaxonomic investigations of several plant species are giving astounding results. Progress is being made toward the use of unicellular fungi in the worldwide control of mosquitoes. And computerized control of carbon dioxide concentration on growth chambers in the Jordan Greenhouse has been implemented.

Faculty published 11 papers in national and international journals and presented five invited seminars to schools in this and adjacent states. One faculty member visited Geneva, Switzerland, at the request of the World Health Organization. Faculty members served as manuscript referees for various journals.
All members of the faculty applied for and received research support during this past year from agencies like the National Science Foundation, Water Resources Research Institute, World Health Organization, S. C. Public Service Authority, Army Corps of Engineers and Faculty Research Council. Additional proposals are awaiting funding.

There are presently five students in the Ph. D. program and seven in the master's program. This year saw the establishment of a chapter of Phi Epsilon Phi, a rebirth of the national honorary botanical society primarily for undergraduates.

The Botany Club was one of the largest and most active campus organizations last year. The club holds an annual plant sale and sponsors major field trips to the Everglades, Big Bend National Forest in Texas and other interesting areas. It also invites speakers to campus and promotes other educational events.

**Department of Chemistry and Geology**

The rebuilding of the department has continued, resulting in increased research productivity and national and international visibility.

Two distinguished teachers retired at the end of the previous year. They, and a visiting instructor, have been replaced by three new chemists, one in physical biochemistry, one in inorganic and organometallic chemistry, and the third in inorganic chemistry. These faculty have already attracted a number of research students to their groups and are involved in a vigorous teaching and research program.

The number of faculty research grants and contracts is increasing and, while still not at its optimum level, has reached satisfactory proportions. New grants have been received from the Department of Energy, the National Science Foundation, the Petroleum Research Fund, the Schering-Plough Foundation, and the South Carolina Heart Association, in addition to new Faculty Research Council grants, one to chemistry and two to geology professors. Existing NSF, NIH and Water Resources Research grants have been renewed, and the National Science Foundation has provided a grant for the second year to permit 10 undergraduate students to conduct research during the summer.

A UV spectrophotometer was purchased during the year, and the undergraduate analytical chemistry lab equipment was upgraded. However, much remains to be done in this area both at the undergraduate level and at the large research instrument level.

A faculty member returned in January from sabbatical leave at the Office of Naval Research and has initiated a research program based on his experiences there. Another is on sabbatical leave at Los Alamos Scientific Laboratories. During the past year, a distinguished scientist from the University in Marseilles spent a semester in the Chemistry Department at Clemson. Another professor came from South Africa to spend a few months doing research in membrane chemistry, and a third
came from Egypt to research organic chemistry with the department head.

Improvements in the level of external funding, as well as the increase in the number of graduate students and postdoctoral fellows, have increased research productivity. Chemistry faculty published 26 papers, presented 20 papers at scientific meetings and gave 23 invited or plenary lectures. Geology faculty published six papers and presented seven papers at scientific meetings. The departmental seminar program provides a lively forum for discussion and brings to campus distinguished scientists from all over the world. The Distinguished Chemical Industry Lecture Series is also thriving and popular.

Department Head Rudolph Abramovitch received the Outstanding Research Scientist award for 1981 from the Society of Sigma Xi.

Department of Computer Science

During its third year of operation, the department graduated its first computer science majors and continued to develop instructional, research and public service programs.

This was the first year in which there were B.S. and M.S. programs in computer science at Clemson. Approximately 200 undergraduates chose to major in computer science, and 12 students were in the M.S. program. Eight students graduated with the B.S. degree and two with the M.S. These students were in high demand by employers and commanded higher than average starting salaries.

Development of the departmental computer laboratory continued. An NSF grant went toward purchase of a microprogram development system, and other grants and gifts are being pursued.

The department is heavily involved in the Clemson upper division program at Greenville TEC, which was established during the year. Interest by potential students in the computer science major offered by Clemson in Greenville has been very strong. Courses for this program will be offered beginning in 1981-82.

The department offered continuing education courses for the first time. A highly successful workshop on data processing concepts was conducted twice. In the public service area, a conference on small computer selection was scheduled.

The shortage of faculty continues to be the most serious problem. The number of available positions nationally is more than 10 times greater than the number of qualified applicants, and as a result the department has been unable to fill its open positions. A severe shortage also exists in office and laboratory space.

During the year, 2,720 students enrolled in computer science courses, an increase of 49 percent over the previous year. During the past three years, enrollment has increased 108 percent.
Department of Mathematical Sciences

Both the undergraduate and doctoral-level credit hour production of the Mathematical Sciences Department for fall 1980 was one-eighth that of the entire University. This steady growth reflects the important role of the mathematical sciences in our technological society.

Thirty-six math majors received bachelor's degrees, 16 received master's degrees, and four students whose dissertations were directed by faculty of the department received doctoral degrees. Two of the Ph.D. recipients earned their degrees through the management science doctoral program, which is jointly administered by the departments of Industrial Management and Mathematical Sciences.

Developed with the aid of a four-year NSF Grant, "An Alternative in Higher Education in the Mathematical Sciences," math graduate programs were commended by the South Carolina Commission on Higher Education in a review of graduate programs. The programs continue to be productive. Since 1970, more than one-eighth of the doctoral degrees awarded by Clemson University were directed by faculty of the Mathematical Sciences Department. Moreover, the department has led in redefining the nature of master's degree programs in the mathematical sciences nationally. Since 1975 it has awarded more than 100 degrees in its restructured master's program.

Research contracts and grants in force initiated by department faculty totaled $631,674 during 1980-81. This amount includes an 11th year of funding by the Office of Naval Research to support research in statistical sampling methodology. Also included are budgeted funds for the department's five-year research grant in discrete structures through the National Science Foundation's Experimental Program to Stimulate Competitive Research. Twelve of our faculty are participants in this grant.

Department of Microbiology

The year marked completion of the department's first decade of existence. Throughout this period, teaching and research programs in microbiology have improved in quality and effectiveness. However, this tenth year has probably been the most significant, highlighted by approval of a doctoral degree in microbiology to be implemented August 1981. This program will be unique within the State, since basic, molecular and applied (excluding clinical) areas of microbiology will be emphasized.

During the fall semester, 132 and 29 students were enrolled in the B.S. and M.S. programs, respectively. Throughout the year, 26 B.S. and four M/S. degrees were awarded. A total of 1,116 undergraduate and 191 graduate students were enrolled in departmental courses. Thus, considerable instruction was provided for majors in other disciplines like nursing and agriculture.
Faculty obtained four new research grants/contracts, bringing the total external research funds to $897,820. These monies originate from NIH, U. S. Army, Sea Grant and private industries. A diverse research program was operated. For example, projects related to understanding the mechanisms of cancer; conversion of waste cellulose to fuel; prevention of infections associated with prostheses; control of disease in eels; genetic engineering for production of chemicals of value in agriculture, health and fermentation fields; ecology of coastal environments; control of gonorrhea; biogenesis of methane; control of dental caries; and repair of radiation-damaged genetic material.

Faculty published eight articles in scholarly journals, presented 17 papers to professional societies and two invited papers at national symposia, and gave 29 invited seminars at various academic and industrial institutions.

Three faculty served as president, vice-president and secretary-treasurer of the South Carolina branch of the American Society for Microbiology, and, together with officers from neighboring states, organized a regional meeting at which one of our students received an award for the best student paper presented.

Collaboration with the Microbiology Department at USC, Columbia, has continued. Ten scientists visited the department and presented seminars.

Department of Physics and Astronomy

Instruction, research and public service programs of the department continue to contribute substantially to the University’s educational objectives.

A major textile manufacturer awarded a large research grant to one of the faculty. It will support fundamental investigations of the properties of nonwoven fabrics, using the approach of computer simulation to determine the macroscopic properties of the material from a knowledge of the size and number density of the individual fibers. This approach to the theory of nonwoven textiles constitutes a new way of studying their properties and may be of fundamental importance in the field of textile science and technology. The method should also be applicable to other nonwoven materials like pulp and paper products.

The department continues to teach service courses to many sciences, engineering and agriculture majors. It also teaches elementary physics and astronomy to nonscience majors. This year a record 13,717 student credit hours of physics and astronomy courses were taught. Our planetarium is a valuable asset in astronomy instruction, as well as a facility for presenting popular star shows for elementary and secondary school groups and the general public.

The year 1981 marks the 20th anniversary of the department’s Ph.D. program. The doctoral program that has developed has been a very
active one, and it is expected that the 70th Ph.D. degree will be awarded in 1981. Of the 27 Ph.D. granting physics departments in the Southeast, Clemson now ranks seventh in number of degrees conferred during the past five years. Of 51 U. S. land-grant institutions, it ranks 27th. It has awarded roughly one-eighth of all doctoral degrees Clemson has conferred.

Department of Zoology

In the 1980 fall semester, 118 students were pursuing the B.S. degree in zoology. Twenty-one graduate students were enrolled in the M.S. program and 23 in the Ph.D. program. Zoology has the largest doctoral program at Clemson. During the 1980-81 academic year, 29 students graduated with a B.S., eight with an M.S., and three with the Ph.D. degree. A B.S. degree program in zoology was approved and will accept students in the fall of 1981.

Research and training activities were supported by 12 outside grants or contracts: four from the National Science Foundation, two each from the U. S. Department of Agriculture and the U. S. Army, and one each from the National Institute of Health, South Carolina Sea Grant, Electric Power Research Institute and U. S. Forest Service. One faculty member and his doctoral student are also participating in a contract with Diamond Shamrock. Since 1974, the department has attracted outside funds in excess of $1.3 million to support its research and graduate training activities.

Small grants received during the year include three from Sigma Xi, one from the Theodore Roosevelt Fund to doctoral candidates, four Faculty Research Grants and one each from the Highlands Biological Station, American Philosophical Society, and N.S.F. (travel) to faculty.

Scholarly activities by faculty and students during the year included two papers presented at international meetings and 37 papers presented at national and regional meetings. One book, 18 scientific papers, four chapters or review articles and 24 abstracts were published.

Professional and service contributions by members of the faculty include the following activities: co-editor of Symposium on Developmental Biology of Fishes published in the “American Zoologist” (21:317-598); associate editor of the “Journal of Experimental Zoology” and the “Journal of Environmental Biology of Fishes”; Board of Reviewers of the American Microscopical Society; secretary of the Animal Behavior Society; Executive Committee of the Wilson Ornithological Society; Awards Committees of the American Ornithologists’ Union and the Southeastern Society of Parasitologists; South Carolina Sea Grant Education Committee; chairman of the South Carolina Heritage Trust Advisory Board; chairman of the Highlands Biological Station Board of Scientific Advisors; and member of the State Rhodes Scholarship Selection Committee.
Faculty members gave 15 seminars at other institutions, and 16 outside speakers visited our campus and presented seminars.

Our collections of vertebrates (including the Harllee collection of bird eggs) continue to grow and attract visitors. Plans for the Piedmont Field Museum to support teaching, research and service through continuing education are under development.

The addition of five terminals and a remote printer connected to the main computer and the acquisition of word-processing equipment in our office area have greatly increased our data processing and handling capabilities and will support all aspects of our educational mission.

**Biology Program**

During the 1980-81 academic year, 3,755 students were enrolled in courses offered by the Biology Program. A new Teacher Information Processing System computer program designed for computer-assisted instruction in biology proved to be a popular and successful vehicle for improving student performance and formed the basis for submission of a National Science Foundation CAUSE proposal.

The second Clemson University Biology Merit Exam was conducted, with approximately 900 high school students and 60 high school teachers attending.

A comprehensive program of graduate-level summer short courses for high school biology teachers was initiated this year and will continue to expand with new course offerings in more than 30 areas of biology. The program's goal is to improve the quality of biology education in the State. Sixty teachers attended the five different courses offered.

Faculty developed and distributed a collection of 50 short laboratory exercises for use in high school or college biology classrooms. A modified version was developed for Advanced Placement teachers, and several Advanced Placement biology workshops were conducted by faculty in both South Carolina and Georgia.

Faculty presented papers or workshops at meetings of the South Carolina Science Council, South Carolina Association of Biology Teachers, South Carolina Academy of Sciences, National Association of Biology Teachers and National Association of Biology Laboratory Educators. Several papers were published as a result of these activities.

The Biology Program became an official academic unit in the College of Sciences as of July 1, 1981.
GRADUATE SCHOOL

Enrollment for fall semester 1980 dropped approximately 6 percent relative to 1979. Total enrollment was 1,959 with 227 in doctoral programs, 562 in Master of Arts and Master of Science degree programs, 709 in professional master's programs, 40 in Education Specialist degree programs, and 421 students with undeclared majors. Of the total enrollment, approximately 500 were enrolled off campus. In addition, 177 students were enrolled in the Clemson-Furman MBA program. Thus, enrollment continued to grow in the M.A., M.S. and Ph.D. degrees while the majority of the decreases appeared in undeclared majors.

A total of 604 advanced degrees were awarded during the academic year, including 28 Ph.D. degrees.

Approximately 50 faculty and staff members attended the fifth annual workshop for graduate advisers held over a two-day period in early September 1980.

The year was a time of change for the Graduate School as it assumed its revised role in the new administrative structure. Most noteworthy were the creation of a University Graduate Curriculum Committee to replace the former Graduate Council and the separation of the Graduate School from the Office of University Research. A pleasing spin-off from the administrative restructuring has been the increased visibility of the Graduate Student Association and its role in the University Commission on Graduate Studies and Research. This organization's activity has been evident as it attempts to work with the Graduate School to provide an orientation for new graduate students for fall semester 1981.

OFFICE OF UNIVERSITY RESEARCH

The Office of University Research provides 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 1980-81 the office processed 353 faculty proposals. 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 (28 active projects); the Biomedical Research Support Grant Committee (9 active awards); the Faculty Research Committee (37 active awards); the Laboratory Animal Welfare Committee; and the Institutional Biosafety Committee (1 active project).
More than 640,000 visitors passed through the Cooper Library during 1980-81. This figure, which includes an increase of 17 percent over the prior year, is in part due to additional study space opened early in 1980. However, the increase is also reflected in a slight growth in the number of items borrowed and an outstanding increase in on-line computer searches. This latter increase has required a substantial change in the thrust of public service programs. With growing sophistication of information retrieval technology, users are more inclined each year to seek solutions to information needs by means of automated systems. As a result, library staff did twice as many on-line searches using commercial data bases as in the preceding academic year. This growth rate is expected to continue for several years. Therefore, the library also has been motivated to provide access to its own collections via computer systems.

More sophisticated and timely information needs of users combined with serious inflation in personnel costs have required the library to automate services and functions. With a general automation design study, which pin-pointed needs developed in 1979-80, library staff evaluated existing library automation systems in fall 1980 and at the end of the year recommended the University administration replicate the NOTIS system of Northwestern University. This system will provide Clemson with campus-wide computer terminal access to all library holdings including current journal issues. It will also allow the library to handle acquisitions, bibliographic control and circulation of materials with one consolidated, automated system.

Several other new efforts to better serve patrons began this past year. These include an acquisitions approval plan and a liaison program. Arrangements were completed with the Baker and Taylor Company (B&T) of Sommerville, N. J., to provide an approval plan slip service to Cooper Library starting in late August.

Through this service, the Cooper Library receives biweekly packets of slips describing newly published books from all domestic and many foreign publishers. This plan operates like a current awareness or selective dissemination of information service. The subject interests of the library have been profiled on a B&T computer. A slip is produced for each new book published, based on a comparison of subject content with the profile. Each slip may then be examined and a decision made regarding purchase of the item.

This service reduces the need to review catalogs and announcements of new books and the workload involved in bibliographic searching. Since the slips appear before printed announcements, the library receives more timely information, and orders are delivered in half the normal time.
To help implement use of this service, the library established a liaison program with colleges and departments. Individual librarians worked with each department or college to improve communications and facilitate selection of purchases for the library.

Additional efforts to improve services to patrons have involved visits to agricultural experiment stations to evaluate needs of researchers and development of several brochures to instruct users. Two librarians from the Science and Technology Division visited the Sandhill, Edisto and Pee Dee stations. The information gained by these visits was used to restructure communications with off-campus faculty and staff. Descriptive brochures on the main and College of Architecture libraries as well as a Library Facts brochure were made available to users.

Although users have the most dramatic impact on library services, some outside factors also play a part in shaping the library. One of the most important of these is the book of rules by which materials are cataloged. The basic rules have been significantly revised, and the new set was implemented in January 1981. Although the long-range impact of these rules is not yet evident, it is clear that they have increased staff workload. More importantly, however, they have modified many embry points in the card catalog. As changes are made in line with these new rules, access to many parts of the collection should improve.

During early 1981 Joseph F. Boykin was named director of the University Library. Boykin came to Clemson from the position of director at UNC-Charlotte. He has bachelor's and master's degrees in history and library science, respectively, from Florida State University.

Statistics

1. COLLECTIONS:

<table>
<thead>
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<th>Volumes Added</th>
<th>Gross</th>
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<tr>
<td>Cataloged</td>
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<td>U.S. Government documents</td>
<td>12,513</td>
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<td>U.S.D.A.</td>
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<td>Sirrine</td>
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<tr>
<td>Architecture</td>
<td>240</td>
<td>—</td>
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<td></td>
<td>34,143</td>
<td>835,166</td>
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Holdings

1979-80                   801,023
Added                     34,143
Total bound volumes       835,166
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<th>Description</th>
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<tr>
<td>Microfilm reels</td>
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<td>Microfiches</td>
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<td>Bound volume equivalent</td>
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<td>Grand Total</td>
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### Serial Titles

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<td>Periodicals</td>
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<td>Other serials</td>
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<tr>
<td>Total</td>
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#### 2. CIRCULATION:

**Door count of visitors**

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<tr>
<td>Cooper</td>
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<tr>
<td>Architecture</td>
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<tr>
<td>Total</td>
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**Books Circulated**

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<td>Cooper</td>
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<td>Architecture</td>
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<tr>
<td>Total</td>
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#### 3. REFERENCE SERVICES:

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<th>SS&amp;H</th>
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<tr>
<td>Reference questions</td>
<td>6,975</td>
<td>17,669</td>
<td>24,644</td>
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<td>Directional questions</td>
<td>7,423</td>
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<tr>
<td>Research</td>
<td>250</td>
<td>250</td>
<td>250</td>
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<tr>
<td>Total</td>
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<table>
<thead>
<tr>
<th>Description</th>
<th>Gross</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Computer searches</td>
<td>181</td>
<td>11</td>
<td>192</td>
</tr>
<tr>
<td>Interlibrary loans</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Loaned</td>
<td>2,565</td>
<td>841</td>
<td>3,406</td>
</tr>
<tr>
<td>Borrowed</td>
<td>1,299</td>
<td>910</td>
<td>2,209</td>
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</table>
This was a relatively trouble-free year for the Computer Center and one in which steps were taken toward addressing some of the major deficiencies in service.

The center experienced the familiar growth in machine use which has now begun to strain the capabilities of the IBM 3033 computer. To permit the addition of further terminals in response to the ever-increasing demand, additional memory was installed. The old disk drives were replaced by newer, faster models. Machine response times continue to deteriorate, however, and the 3033 will be ready for replacement in 1982.

In order that growth in academic utilization proceed in an orderly manner, the computer Advisory Committee set up a long-range planning subcommittee. Three areas of prime concern were identified: weak support for graphics and for research, and the University’s ability to provide the necessary support for the central system to enable the growth of past years to continue.

Despite these concerns, growth has continued, and no slowdown is anticipated. In the summer of 1981 new remotes will be installed in the library and at Greenville TEC, and a number of other remotes have been expanded. The problems of research and graphics computing should be addressed in the next 12 months by the acquisition of separate computers for these applications.

Computer center revenue continues to rise, exceeding expectations in 1980-81 by more than $400,000. Estimates for the upcoming year have been revised accordingly. The center has become increasingly involved in research projects to generate revenue and acquire equipment. It is expected that such projects will become increasingly important.

Apart from a shortage of computing power, the remaining problems are old ones. The center still has insufficient electrical power and air-conditioning and inadequate physical space. These problems can be solved, however. The next mainframe machine will require substantially less power and cooling, and the space problem can then be addressed by further expansion in the basement of the P&AS building.

On balance, 1980-81 was a successful year for the center. In spite of high inflation, increased demand for services, and the tight job market, the center operated within its budget. This cannot be expected to continue, however, unless the center has the resources, in both hardware and personnel, to attract the outside work which has fueled its growth in the past.
Division of Administrative Programming Services

The Division of Administrative Programming Services (DAPS) develops and maintains computerized information systems for the University administration. The division consults with University departments and helps them design computerized and manual systems to support routine operational needs as well as management decisions. A key ingredient in DAPS' mission is to design coordinated department systems that operate around an integrated University data base.

During the 1980-81 fiscal year, in conjunction with major users, DAPS implemented the following systems and accomplished these tasks:

1. Performed follow-up work for Phase 1 of an integrated student information system that records student information from the admissions process through registration and enrollment. Expansion of this system to include grade recording, graduate student information and course enrollment information is in progress.
2. Made refinements in the position control and budget system to edit employee funding information against position budget information.
3. Expanded the network of terminals in administrative areas to allow on-line access to certain personnel and accounting records.
4. Modified the payroll system to include many new deductions, reduction in lead time required for data input (fast payroll), ability to change account codes on the time sheet, new automatic bank deposit functions, and additional edits for account and payment codes.
5. Performed the detail design and programming of a material control and purchasing system for Physical Plant materials. The project will be implemented in 1981.
6. Assisted in planning and equipment procurement for a computerized maintenance management system for the Physical Plant. Installation is planned for 1981-82.
7. Enhanced the payroll/personnel system to maintain employee retirement history data. This information can be retrieved for retirement contribution reporting.
8. Completed the general design of a course/section data base and the conceptual design of a curriculum data base.
9. Updated the systems development and maintenance plan that outlines all information systems work to be done over the next three years.
10. Several departments have worked with DAPS in installing, using and planning for word processing equipment. DAPS has helped ensure that word processing hardware and procedures are used effectively in conjunction with existing or planned information systems. A DAPS member served as chairman of the University Word Processing Committee.
11. 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.

12. Enhanced the standards for system development and documentation.

13. Continued to expand the use of computer output microfiche (COM) to save the cost of printing reports on paper and the cost of storing this paper.

14. 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.

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

16. Participated in the second phase of the information needs study of the Robert Muldrow Cooper Library and the preparation of a document outlining a plan for selection and implementation of an integrated library information system.

17. Supported preregistration for summer sessions.

18. Converted admissions acceptance/rejection letters to high-quality letter printer.

19. Continued to support the spring and fall budget processes.

20. Continued to enhance existing administrative systems to take advantage of new Computer Center software and hardware.

21. Implemented additional grant and contract reporting required by the federal government.

22. Implemented a financial aid award letter system to automatically generate letters to financial aid recipients.

All projects expected to be in progress during 1981-1982 are listed in the Clemson University Information Systems Plan. This plan is updated each year, and time expended on each project for the prior year is itemized. Generally, administrative systems development must involve even more than in the past those end-users who will benefit from the systems. Also, techniques to retrieve needed information from administrative data bases must be improved and made more widely available.
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:

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

2. Department of Social Services - Most of the support of DSS in its computer information systems requirements was in the area of MMIS — Medicaid Management Information System. MMIS is a large-scale online 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. Efforts this fiscal year led to the system becoming federally certified, which means the federal government will assume a larger share of the State's Medicaid costs.

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

4. Plant Pesticides Regulatory Service — Maintained and enhanced a system which keeps records of plant pesticides and applicators licensed to use them.

5. U. S. Air Force/Lockheed Corporation — In conjunction with the College of Engineering, development was begun on a logistics support analysis system.

6. U. S. Department of Agriculture Cotton Testing Labs — The USDA Cotton Testing Labs test cotton fibers for 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.
Support from business, industry, foundations, and professional and trade organizations reached an all-time high in 1980 of $1,616,188. This total included $460,399 from business and industry and $924,044 from foundations. Most of these gifts were designated for a variety of academic programs including professorships, scholarships, fellowships, awards and departmental programs.

Gifts of equipment exceeded $40,000 and included two computers, a spectrometer and other laboratory equipment. Endowment gifts amounted to $765,000 and were restricted to endowed chairs, fellowships, scholarships, awards and The Robert Cook Edwards Endowment for Excellence in Science and Technology. Funds for special activities like the minority recruitment program in engineering were also received.

Academic departments received restricted gifts of more than $375,000 for use in their programs and activities. Gifts to assist students with the cost of their education and to recognize academic excellence totaled more than $200,000.

Non-alumni donors have helped various academic departments achieve a high level of quality and academic excellence.

Private gifts provide the means for enhancing the educational activities supported by state appropriations. While state appropriations are the primary support of state institutions, the State cannot be expected to make all institutions centers of academic excellence. Therefore, the ultimate quality of a university rests with private support. By supplementing state and federal appropriations with private funds, credit is brought to both the State and the University.

Clemson University Foundation

The Clemson University Foundation is the organization designated by the Board of Trustees to accept and administer all endowments for Clemson University. It is a non-profit organization which has 21 directors who oversee its activities. There are seven working committees: Deferred Giving, Business and Corporate, Foundations, Agriculture, Forest and Recreation Resources, Investment and Capital Fund.

Alumni Relations and Resources Development

Enrichment of the academic environment is the primary mission of Alumni Relations and Resources Development.

Throughout its history, Clemson University has commanded healthy respect from its contemporaries for the loyalty of its alumni and the dedication of parents, faculty, staff and friends. Harnessing this enthusiasm and guiding it through transition to resources that benefit
Clemson’s educational program at every level has led to new interest, involvement and support from private sources.

One of the annual fund’s first commitments is to those classroom professors whose work at the undergraduate level provides the solid foundation on which serious students can build an education that will prepare them to face the challenge of the ’80s. Unrestricted gifts help attract and keep quality faculty through alumni professorships, visiting professorships and recognition of master teachers.

Ten alumni professors are selected by the provost and academic deans with classroom expertise being the primary prerequisite. Each receives annual stipends of $3,000.

Alumni visiting professorships bring noted scholars from all over the world to lecture and teach at Clemson. The various colleges receive this $40,000 annual grant on a rotating basis through a program coordinated by the provost.

Equally important is student scholastic achievement. The prestigious Robert Franklin Poole Alumni Scholarships recognize top high school achievers from across the nation. These 20 renewable scholarships each have a value of $8,000. University alumni scholarships help Clemson compete favorably with other great universities for the nation’s best high school talent. And the alumni presidential scholarships attract hundreds of freshmen to Clemson. Annual fund gifts by campus participants recognize faculty-staff scholars and help with other academic scholarship programs. The Parents Fund and gifts from the University’s friends add other support to the recognition of distinguished students and outstanding teachers. These grants totaled $1,022,230 in 1981.

In August 1980 President Bill Atchley reshaped the administrative make-up of the department. The innovative structure consolidates all annual giving — the Alumni Loyalty Fund, the Faculty-Staff Loyalty Fund, the Parents’ Fund, giving by friends, and the corporate and business matching grants program — in a single department, which also has responsibility for long-range accumulation of assets through the Office for Deferred Giving and Estate Planning.

In the past fiscal year major efforts have been devoted to:

• Upgrading levels of giving to the annual fund.
• Developing a “town and gown” program with the Chamber of Commerce.
• Hosting, with the Student Alumni Council (SAC), a national conference at Clemson for Student Alumni Foundations (Associations).
• Contributing to the formation of the President’s Advisory Group (all advisors are alumni).
• Helping SAC coordinate Orange Carpet Day, which brings outstanding high school achievers and their families to the campus.
• Reorganizing Clemson Clubs outside the State and introducing the president to these groups whenever possible.
• Coordinating the Clemson Medallion Ceremony during Founder’s Week.
• Refining computer requirements for the development by DAPS of on-line systems.

In addition, members of the staff are serving on the campus Master Planning Committee and the University Self-Study Committee. The Alumni Association purchased the D. W. Daniel home adjacent to the Alumni Center to provide quarters for the Clemson University Foundation.

STUDENTS

The 1980-81 academic year marked Clemson’s highest on-campus enrollment with 10,891 students registered for classes (9,827 full-time and 1,064 part-time). An additional 688 were in various off-campus programs bringing total enrollment to 11,579. Of the total, 2,152 were graduate students.

The College of Engineering was again number one in on-campus enrollment in 1980-81 with 2,671 students. The College of Industrial Management and Textile Science, a close second with 2,514 students enrolled, was followed by Education, Sciences, Agricultural Sciences, Liberal Arts, Architecture, Forest and Recreation Resources and Nursing. Architecture, Engineering, Industrial Management and Textile Science, and Sciences had enrollment increases. All other colleges experienced some decrease in enrollment.

Opportunities for higher education continued to increase as evidenced by the growing number of freshmen entering college with advanced standing. In the 1980-81 fall semester, 509 new high school graduates entered Clemson with advanced standing by means of College Board Advanced Placement courses (227), concurrent enrollment in high school and college (72), enrollment in summer school (Clemson, 59; other institutions, 100), and departmental examinations (51).

At Clemson, performance in high school has proven the best single predictor of success in the freshman year. The class ranks of entering freshmen have improved to the point that 42 percent of the 1980 freshman class ranked in the top 10 percent of their class; 70 percent in the top 20 percent; and, 94 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 1980 the freshman class average of 1005 compared with an average of 890 reported by College Board for all high school seniors. It is the highest average among state-supported institutions in South Carolina.

Of the 6,882 new applications for admissions processed for 1980-81, 4,027 were accepted and 2,549 actually enrolled (including freshmen and transfer students). South Carolina residents accounted for 75 per-
cent of the 11,579 students, including those enrolled in off-campus programs. Clemson students come from all 46 South Carolina counties, 47 states, Puerto Rico, the District of Columbia, Virgin Islands, Guam and 42 foreign countries (199 students).

Greenville County continued to be the top county with 1,256 students enrolled. Pickens County was second with 883 students enrolled, followed in order by Anderson, Charleston, Spartanburg and Oconee counties. Most out-of-state students came from the contiguous states of Georgia (449), North Carolina (448) and Florida (338).

Computerized preregistration 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**

<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>
<tr>
<td>1980-81</td>
<td>9,427</td>
<td>2,152</td>
<td>11,579</td>
</tr>
</tbody>
</table>

The 1980-81 figures include 512 students attending off-campus institutions and 176 in the Clemson-Furman University Master of Business Administration degree program.

The on-campus enrollment of women at Clemson reached an all-time high during the 1980 fall semester. There were 4,292 of which 3,727 were undergraduates. Enrollment of undergraduate coeds increased 4.6 percent over last year. Women now constitute more than 39 percent of on-campus enrollment and about 41 percent of total enrollment.

The Clemson student body continues to be a working group receiving a significant amount of financial assistance in the form of loans, grants, scholarships and work assistance. In 1980-81 approximately 3,195 students earned an estimated $4,940,378 working for the University. This figure does not include earnings from off-campus employment. Clemson awarded 495 long-term loans totaling $337,425. The University also approved and certified 1,600 guaranteed student loans from a variety of lending institutions. Excluding donor-selected scholarships, 364 schol-
arships and grants, valued at $271,511, were awarded. The number of students receiving Basic Grants was 1,900, with awards totaling $1,698,000. In all, an estimated 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, leadership development, program planning and policy development. They represent Clemson at various conventions and competitions throughout the nation. In 1980-81, the 223 organizations initiated 21 projects for local and national charities and sponsored 52 projects for organizational gain.

Student Government profited from strong, capable and dedicated leadership. The president reorganized the Executive Branch and formed an Executive Council in addition to the President's Cabinet. A total of 3,271 students voted in campus-wide elections in the spring indicating an increased interest in Student Government.

Communications between students and administrators were improved through GRASSROOTS, a new student opinion poll. This telephone survey was conducted monthly by members of the Research and Development Committee of the Student Government in cooperation with the Office of Student Life.

The Department of Services increased the coin-operated (5 cents) copier service with the addition of two copiers in the library. The shuttle service ran smoothly transporting approximately 1,400 passengers per week. Reimbursement for emergency medical training was made to nine students who completed a semester's work with the Clemson Emergency Medical Service.

In other areas of student services, a tour guide program for prospective students and their families doubled in size. Members of leadership and service organizations provided 350 tours for potential Clemson families.

Student media organizations have proven effective outlets for student opinion and creativity. "TAPS" was awarded Best Yearbook in South Carolina by the South Carolina Press Association (SCPA) and was judged first class by the Associated Collegiate Press (ACP) Critique Service. "The Tiger," Clemson's weekly newspaper, earned the title of Best College Newspaper in South Carolina from the SCPA and received five-star all-American honors from the ACP Critique Service. WSBF completed requirements for filing an application to increase power outage from 10 to 1,000 watts.

Sororities continue to grow in size and popularity at Clemson. In March the ninth national sorority, Delta Gamma, colonized with 76 pledges. Sororities have an average of 115 members, and the campus total includes approximately 24 percent of the undergraduate women at Clemson. The grade-point average for all sorority women is 2.82.
The fraternity system remained stable with 16 chapters of national college fraternities comprising approximately 15 percent of all undergraduate males. The scholastic average for the fraternity system for the fall semester, 2.41, was below the average for all men, 2.47. All chapters continued their philanthropic projects. The total amount raised was more than $15,000.

Parking and traffic records are maintained to coincide with the academic calendar from August 15 to August 15 each year. During the period August 15, 1980 through May 8, 1981, 9,433 student parking decals were issued and $17,904 was deposited to the Miscellaneous Income Account (MIA). The Campus Security Office wrote 33,942 student parking tickets during the same period. The total amount of parking fines collected at the Traffic Office and deposited to the MIA was $35,510, while $91,844 was turned over to the Accounting Office for collections. The Student Traffic Review Board heard appeals for 1,449 students involving 1,748 parking tickets, or about 5 percent of the tickets written.

In the area of returned checks, 1,520 student checks were returned to the Student Life and Traffic Office. Approximately 90 percent of the $101,920.57 from returned checks was by the Student Life and Traffic Office.

Career Services, which is composed of Placement and Cooperative Education, continued to expand its services. The Placement Office coordinated the visits of 263 companies/agencies in the fall and 258 in the spring. They conducted more than 7,700 interviews, which is almost a 25 percent increase over last year.

More than 1,100 seniors registered with the Placement Office. The average salary offer increased approximately 10 percent over last year. Based on the number of employers prescheduled for the 1981-82 school year, the employment outlook for Clemson students continues to look good.

Clemson's Cooperative Education Program continued to grow in 1980-81. More than 360 students participated in the program. Collectively, these students earned more than $1,397,000 to help offset rising costs of higher education. The 11.5 percent growth for this year reflects only a modest increase compared to the forecast expansion in the next two years. Because of more restrictive and limited federal funds, the Cooperative Education Program should increase dramatically as more students look to it for financial help.

In 1980-81, seven Clemson teams finished in the top 20 in the nation in their respective polls or NCAA-AIAW tournaments. Twelve athletes made All-American selections 14 times in 10 different sports, giving Clemson 30 All-Americans over the past two years.

Additionally, Clemson won four ACC titles, giving the Tigers 13 conference crowns in seven different sports over the past three seasons.
A total of 29 athletes were chosen All-ACC or were champions of an event at the conference meets this year. Only one of the 19 sports at Clemson recorded a losing season. That sport missed the .500 mark by only one match.

Individually, Hans Koeleman became the first Clemson athlete in history to be named an All-American three times in one year. Koeleman finished in the top 10 in the NCAA cross country meet and was also an All-American at the indoor two-mile run and the outdoor steeplechase. He is a sophomore and should challenge for NCAA championships before he graduates.

<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>34-34</td>
<td>First</td>
<td>NCAA Atlantic regional</td>
</tr>
<tr>
<td>Basketball</td>
<td>20-11</td>
<td>Fifth, Tie</td>
<td>National Invitation Tournament</td>
</tr>
<tr>
<td>Cross Country</td>
<td></td>
<td>First</td>
<td>Eighth in NCAA meet</td>
</tr>
<tr>
<td>Fencing</td>
<td>13-1</td>
<td>First</td>
<td>Fourth in NCAA meet</td>
</tr>
<tr>
<td>Football</td>
<td>6-5</td>
<td>Fourth, Tie</td>
<td></td>
</tr>
<tr>
<td>Golf</td>
<td></td>
<td>Fifth</td>
<td></td>
</tr>
<tr>
<td>Indoor Track</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soccer</td>
<td>12-3-2</td>
<td>Second, Tie</td>
<td>Koeleman AA in 2-mile</td>
</tr>
<tr>
<td>Swimming</td>
<td>6-3</td>
<td>Third</td>
<td>20th in final poll</td>
</tr>
<tr>
<td>Tennis</td>
<td>31-7</td>
<td>First</td>
<td>Six Swimmers in nationals</td>
</tr>
<tr>
<td>Outdoor Track</td>
<td></td>
<td>Third</td>
<td>Seventh</td>
</tr>
<tr>
<td>Wrestling</td>
<td>10-8</td>
<td>Sixth</td>
<td>25th in NCAA meet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Women's Sports</th>
<th>Record</th>
<th>ACC Finish</th>
<th>National Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basketball</td>
<td>23-8</td>
<td>First</td>
<td>20th in final poll</td>
</tr>
<tr>
<td>Cross Country</td>
<td></td>
<td>Fourth</td>
<td>ranked as high as 16th</td>
</tr>
<tr>
<td>Fencing</td>
<td>8-6</td>
<td></td>
<td>Participated in nationals</td>
</tr>
<tr>
<td>Field Hockey</td>
<td>12-5-2</td>
<td>Third</td>
<td>Participated in regionals</td>
</tr>
<tr>
<td>Swimming</td>
<td>4-4</td>
<td></td>
<td>8 Swimmers to nationals</td>
</tr>
<tr>
<td>Tennis</td>
<td>28-7</td>
<td>Second</td>
<td>Ninth in final national poll</td>
</tr>
<tr>
<td>Volleyball</td>
<td>21-22</td>
<td>Third</td>
<td>Participated in regionals</td>
</tr>
</tbody>
</table>
Fall Semester 1980 Enrollment By Colleges and Degrees Awarded December 1979 - August 1980

<table>
<thead>
<tr>
<th>Main Campus Enrollment</th>
<th>Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Semester Associate Bachelor's Master's Specialist Doctorates Total</td>
<td></td>
</tr>
<tr>
<td>Agricultural Sciences 956 0 183 76 0 12 271</td>
<td></td>
</tr>
<tr>
<td>Architecture .......... 498 0 79 30 0 0 109</td>
<td></td>
</tr>
<tr>
<td>Education ............. 1,269 0 265 277 17 0 559</td>
<td></td>
</tr>
<tr>
<td>Engineering .......... 2,671 0 332 60 0 2 394</td>
<td></td>
</tr>
<tr>
<td>Forest &amp; Rec. Resources 489 0 140 15 0 0 155</td>
<td></td>
</tr>
<tr>
<td>Ind. Mgt. &amp; Text. Science 2,514 0 408 18 0 5 431</td>
<td></td>
</tr>
<tr>
<td>Liberal Arts .... 815 0 154 8 0 0 162</td>
<td></td>
</tr>
<tr>
<td>Nursing .......... 339 36 78 5 0 0 119</td>
<td></td>
</tr>
<tr>
<td>Sciences .......... 1,243 0 152 46 0 10 208</td>
<td></td>
</tr>
<tr>
<td>Non-degree .......... 97 97 97 97 97 97 97</td>
<td></td>
</tr>
<tr>
<td>TOTALS ........... 10,891 36 1,791 535 17 29 2,408</td>
<td></td>
</tr>
</tbody>
</table>

Degrees awarded since 1896 (through August 1980) total 44,711 of which 386 have been associate degrees; 36,461 bachelor's degrees; 7,218 master's degrees; 78 education specialist degrees; and 568 doctorates.
### 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>
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<tr>
<td>1978</td>
<td>290</td>
<td>3</td>
</tr>
<tr>
<td>1979</td>
<td>341</td>
<td>3</td>
</tr>
<tr>
<td>1980</td>
<td>305</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>
<tr>
<td>1980</td>
<td>15.6:1</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>
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<tr>
<td>1977</td>
<td>985</td>
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<tr>
<td>1978</td>
<td>1000</td>
</tr>
<tr>
<td>1979</td>
<td>1002</td>
</tr>
<tr>
<td>1980</td>
<td>1005</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>
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<tr>
<td>1974</td>
<td>591.8</td>
</tr>
<tr>
<td>1975</td>
<td>602.5</td>
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<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>
<tr>
<td>1980</td>
<td>718.2</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>
<tr>
<td>1980</td>
<td>2,008</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>
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<td>5,232</td>
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<td>1977</td>
<td>6,301</td>
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<td>1978</td>
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<tr>
<td>1979</td>
<td>6,708</td>
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<tr>
<td>1980</td>
<td>6,858</td>
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### 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>60%</td>
</tr>
<tr>
<td>1980</td>
<td>59%</td>
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### Retention Rate of Students
(Freshman Class)

<table>
<thead>
<tr>
<th>Year</th>
<th>Score</th>
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<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>1973</td>
<td>83%</td>
</tr>
<tr>
<td>1974</td>
<td>83%</td>
</tr>
<tr>
<td>1975</td>
<td>82%</td>
</tr>
<tr>
<td>1976</td>
<td>84%</td>
</tr>
<tr>
<td>1977</td>
<td>84%</td>
</tr>
<tr>
<td>1978</td>
<td>87%</td>
</tr>
<tr>
<td>1979</td>
<td>87%</td>
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</tbody>
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Number of Dorm Beds and Percent Being Utilized

<table>
<thead>
<tr>
<th>Year</th>
<th>Beds</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>5,190</td>
<td>93</td>
</tr>
<tr>
<td>1971</td>
<td>5,174</td>
<td>97</td>
</tr>
<tr>
<td>1972</td>
<td>5,174</td>
<td>100</td>
</tr>
<tr>
<td>1973</td>
<td>5,330</td>
<td>102</td>
</tr>
<tr>
<td>1974</td>
<td>5,592*</td>
<td>101</td>
</tr>
<tr>
<td>1975</td>
<td>5,616*</td>
<td>103</td>
</tr>
<tr>
<td>1976</td>
<td>5,625*</td>
<td>103</td>
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<tr>
<td>1977</td>
<td>5,662*</td>
<td>103</td>
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<tr>
<td>1978</td>
<td>5,683*</td>
<td>104</td>
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<tr>
<td>1979</td>
<td>5,726*</td>
<td>106</td>
</tr>
<tr>
<td>1980</td>
<td>6,317*</td>
<td>112</td>
</tr>
</tbody>
</table>

* Includes beds in the Clemson House:

<table>
<thead>
<tr>
<th>Year</th>
<th>Beds</th>
<th>Year</th>
<th>Beds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>252</td>
<td>1978</td>
<td>317</td>
</tr>
<tr>
<td>1975</td>
<td>262</td>
<td>1979</td>
<td>324</td>
</tr>
<tr>
<td>1976</td>
<td>271</td>
<td>1980</td>
<td>329</td>
</tr>
<tr>
<td>1977</td>
<td>308</td>
<td></td>
<td></td>
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</table>
## CURRENT OPERATING FUNDS

### Revenues and Additions by Source

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Fees</td>
<td>$12,587,114</td>
<td>10.22%</td>
</tr>
<tr>
<td>State Appropriations:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational and General</td>
<td>$40,791,255</td>
<td>33.11%</td>
</tr>
<tr>
<td>Agricultural Research and Public Service</td>
<td>$22,876,671</td>
<td>18.56%</td>
</tr>
<tr>
<td>Federal Appropriations:</td>
<td></td>
<td></td>
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<tr>
<td>Educational and General (Morrill-Nelson)</td>
<td>$121,373</td>
<td>.10%</td>
</tr>
<tr>
<td>Agricultural Research and Public Service</td>
<td>$9,656,862</td>
<td>7.84%</td>
</tr>
<tr>
<td>Sales and Services of Educational Departments</td>
<td>$1,581,960</td>
<td>1.28%</td>
</tr>
<tr>
<td>Miscellaneous Sources</td>
<td>$4,367,187</td>
<td>3.54%</td>
</tr>
<tr>
<td>Endowment Income</td>
<td>$243,590</td>
<td>.20%</td>
</tr>
<tr>
<td>Sales and Services of Auxiliary Enterprises</td>
<td>$17,056,843</td>
<td>13.84%</td>
</tr>
<tr>
<td>Federal Grants and Contracts</td>
<td>$6,304,383</td>
<td>5.12%</td>
</tr>
<tr>
<td>State Grants and Contracts</td>
<td>$906,115</td>
<td>.74%</td>
</tr>
<tr>
<td>Local Grants and Contracts</td>
<td>$64,731</td>
<td>.05%</td>
</tr>
<tr>
<td>Private Gifts, Grants and Contracts</td>
<td>$6,654,647</td>
<td>5.40%</td>
</tr>
<tr>
<td><strong>TOTAL REVENUES AND ADDITIONS</strong></td>
<td><strong>$123,213,031</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

Brought Forward from 1979-1980 for Encumbrances and Restricted Funds Balance: $11,475,643

**TOTAL FUNDS AVAILABLE**: $134,688,674

### Expenditures by Function

<table>
<thead>
<tr>
<th>Function</th>
<th>Amount</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction</td>
<td>$31,069,062</td>
<td>25.85%</td>
</tr>
<tr>
<td>Research-Department</td>
<td>$6,961,090</td>
<td>5.81%</td>
</tr>
<tr>
<td>Research-Agricultural Experiment Station</td>
<td>$13,555,999</td>
<td>11.28%</td>
</tr>
<tr>
<td>Extension and Public Service</td>
<td>$1,775,320</td>
<td>1.48%</td>
</tr>
<tr>
<td>Extension and Public Service-Cooperative Agri. and Extension Service</td>
<td>$18,127,583</td>
<td>15.08%</td>
</tr>
<tr>
<td>Extension and Public Service-Regulatory Service</td>
<td>$4,029,618</td>
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</tr>
<tr>
<td>Academic Support</td>
<td>$6,185,871</td>
<td>5.15%</td>
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<tr>
<td>Student Services</td>
<td>$3,336,752</td>
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<tr>
<td>Institutional Support</td>
<td>$7,616,976</td>
<td>6.34%</td>
</tr>
<tr>
<td>Operation and Maintenance of Plant</td>
<td>$7,421,958</td>
<td>6.17%</td>
</tr>
<tr>
<td>Auxiliary Enterprises</td>
<td>$18,376,671</td>
<td>15.29%</td>
</tr>
<tr>
<td>Scholarships and Fellowships</td>
<td>$1,709,883</td>
<td>1.42%</td>
</tr>
<tr>
<td><strong>TOTAL EXPENDITURES</strong></td>
<td><strong>$120,186,783</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

Transfers and Other Deductions: $3,421,693

**TOTAL EXPENDITURES, TRANSFERS AND OTHER DEDUCTIONS**: $123,608,476

Balance 6/30/81 for Encumbrances and Restricted Funds Balance: $11,080,198

**TOTAL EXPENDITURES AND BALANCE**: $134,688,674
## Scholarships and Student Aid and Loan Funds
### Fiscal Year 1981

### Revenue

<table>
<thead>
<tr>
<th>Source</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Interest on Loans</td>
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</tr>
<tr>
<td>Gifts, Grants and Contracts</td>
<td>$3,223,334.01</td>
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<tr>
<td>Endowment Income</td>
<td>$204,378.21</td>
</tr>
<tr>
<td>Investment Income</td>
<td>$537,306.07</td>
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<tr>
<td>Other Income</td>
<td>$12,701.00</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$3,993,689.92</strong></td>
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### Disbursements

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational Loans</td>
<td>$342,425.00</td>
</tr>
<tr>
<td>Grants for Scholarships and Fellowships (Including Grants-in-Aid)</td>
<td>$1,703,883.22</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$2,046,308.22</strong></td>
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</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

Clemson's S. C. Agricultural Experiment Station conducts South Carolina's only state-funded agricultural research program.

Scientists in the College of Agricultural Sciences' 10 departments provide expertise for the program, with home economics research conducted at Winthrop College. Facilities at Clemson and four branch stations located across the State provide indoor and outdoor laboratories for scientists in agricultural economics, agricultural engineering, agronomy, animal science, dairy science, entomology, fisheries and wildlife, food science, horticulture, plant pathology, and poultry science.

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

The Experiment Station was established in 1886 under federal law and is state controlled, with annual appropriations from the South Carolina Legislature and supplemental funding from the United States Congress.

Experiment Stations operate in all 50 states and conduct both cooperative and complementary research, avoiding duplication of effort and trying to increase the wealth of information responsible for the advances of the past 50 years.

To meet future challenges, the S. C. Agricultural Experiment Station will continue to add research findings to those of researchers in other states with one common goal in mind — creating better standards of living for people through the best possible use of natural resources.

Highlights and Accomplishments

The following summary is a capsule review of the extensive research program at the Experiment Station. Many important studies have been omitted, and the ones that follow are intended only to illustrate the scope of the Station's total program.
Agricultural Economics and Rural Sociology

Economists and sociologists are looking for better ways to understand, develop and use the State's natural and human resources.

In the area of hog-marketing, researchers learned that farm level pork prices lead wholesale prices and wholesale prices lead retail prices. These data help forecast prices and evaluate retailers' and packers' marketing margins. Research into buyer concentration and slaughter hog prices indicated that average slaughter hog prices would have increased if the four-firm buyer concentration level had been reduced to 50 percent from 1978 levels.

Another study revealed that live-hog futures prices are being used by decision makers to set prices. These futures prices have been used to determine sow breeding, feeder-pig marketing and purchasing. These data will help forecast supply responses.

Researchers also constructed a model to forecast the price of tomatoes. The impact of interregional competition on the State tomato industry was also determined. The analysis showed that a 16 percent increase in production in the South will mean a state producer will receive $1.20 less for a 30-pound base; this leaves only $2.10 per box for returns to land, risk and management.

Another study examined the burden of uncertainty of government commodity programs. Results showed that participation in government programs might lower income expectations by 5 to 10 percent. However, the nonparticipants' risks are 200 percent greater. State farmers do not participate heavily in such programs; they are either risktakers or in need of an educational program concerning costs and benefits.

Another study showed it is profitable to invest in a center pivot irrigation system. Irrigation lets corn and soybean growers obtain either a larger return for the same risk or the same return for a lower risk.

Several studies concerning rural South Carolina were conducted, with one showing that the federal welfare programs are designed for urban rather than rural areas. Another project investigated the impact of industrialization on regions and the State. A computerized model was created and used in several rural areas to show effects on taxes, revenues, employment and services.

Agricultural Engineering

Agricultural engineers continued major projects in energy, mechanization and computer applications.

As part of a broad-based energy research project, a wood gasifier, which produces about 1 million BTUs per hour, was constructed. The unit will be evaluated on a private producer's farm as the energy source for curing four barns of tobacco. Other applications will also be evaluated.

A portable ethanol production unit was designed and constructed to
study on-farm still efficiency and the use of feedstocks other than corn, like sweet potatoes and grain sorghum.

Investigating alternate energy utilization in animal structures, researchers are building a passive solar poultry house and planning an energy-efficient swine facility.

In mechanization, fruit, vegetable and aquacultural systems have received major emphasis. A harvest aid for tomatoes and other high-value vegetables has been designed and constructed, along with a mechanical green onion harvester.

A new mechanized production system for fresh market peaches is also being developed. The system uses the high density production system, in which the fruit is mechanically harvested while still on the tree. Current research focuses on a type of shaker that will remove the fruit from the tree with minimum damage.

A mechanical harvester for intertidal oysters yielded 500-600 bushels per hour with minimal damage to the oysters. A program of transplanting oysters from polluted to unpolluted waters was successful.

An automatic shrimp deheader is also under development. A shrimp sizer developed by a private individual can both size and orient shrimp for automatic deheading.

Applying microcomputers to agricultural production systems moved ahead when a grain combine equipped with a computer-based automatic controller was field tested. A microcomputer-based automatic weather station was also constructed and installed and will hopefully be the first of a statewide network. A similar system was developed and is being used with experimental plants to study carbon dioxide effects on growth and nitrogen fixation of legumes.

Another system has been developed to study tobacco curing and may lead to the development of a totally automatic bulk curing system.

Agronomy and Soils

Agronomic research is making efforts to find new farm management practices that producers can use to increase farm profits.

Each year the department conducts statewide research and demonstrations to obtain data growers use to select crop varieties and develop management practices, including fertilizers and weed control chemicals.

Weed control research has shown that with intensive management, cowpeas can be controlled in soybeans by using an appropriate herbicide or a combination of herbicides with cultivation. Current research focuses on problem weeds in soybeans, corn, cotton and peanuts.

Soybean culture research indicates subsoiling in the row usually increases yields in sandy soils in the Coastal Plains. Irrigation improved soybean yields from about 25 bushels per acre to 50 bushels per acre for a
Dothan soil in 1980. Under irrigation, plant population of soybeans can be reduced to increase yields.

Research has shown that under good management, corn and soybean yields are equally as good for no-till as for conventional tillage. Plots under continuous no-till, however, show buildup of problem perennial grasses and some broadleaf weeds. This indicates that if problem weeds are present, weed management may be more difficult for no-till.

Monitoring rainfall shows that 50-60 pounds of limestone per acre are needed annually to neutralize acid to allow maximum plant growth. Acid rain occurs when sulfur dioxide and nitrogen oxide — two gases created from coal and oil furnaces and automobile exhausts — react with vapor and become sulfuric and nitric acids. Since sulfur and nitrogen are two essential nutrients for plants, moderately acid rain is beneficial for most economic plants. The fractional part of crop nutrient requirements will be determined in future research.

Redhill, a new awnless barley variety, has been approved for release. It is an early variety well suited for double cropping with soybeans and grain sorghums. Research has accelerated toward development of wheat varieties resistant to diseases in the Southeast. These will be early varieties and can be followed by soybeans in a double-crop system.

Variety testing of soybeans, tobacco, corn, cotton, peanuts, grain sorghum, the small grains, alfalfa and sunflowers was conducted for yield potential and adaptation in several areas. Continuous yearly testing is made to identify the best varieties for the State.

Progress continues in development of a forage perennial grass adapted to the Coastal Plain. Improvement of fescue and wheat grasses is under way.

Animal Science

Animal science research is aimed at developing cost-effective practices for producing high quality meat products.

One alternative to the millions of tons of poultry waste produced annually is to use this by product as a feed ingredient for farm animals. One project revealed that a high quality feed product may be obtained by mixing cage layer waste with dry corn and peanut hulls and ensiling before feeding.

Young pigs weaned at three or four weeks of age require more energy in their diets than is currently recommended. Adding milk by-products such as casein or whey showed no benefits. A 20 percent protein level supplied by corn or soybean meal is adequate to satisfy protein and amino acid needs. Mixing litters of pigs at weaning has also improved gains by 15 percent over gains noted when pigs were reared in individual litters.

Research continues on embryonic mortality, which causes major financial problems when repeat breeders and low calving rates occur.
There is evidence that the embryo may produce a substance that depresses the defense capacity of white blood cells of the mother. Detecting this substance could prove to be a valuable tool for detecting embryo death. Research is continuing to determine the earliest time the embryo produces this substance.

Animal scientists also continue studying crossbreeding systems and combine this with year-round grazing techniques. High forage rations must be utilized both in the cow-calf program and in the steer-heifer finishing program. Crossbreeding and forage systems can help decrease production costs.

**Dairy Science**

Dairy science research involves both the production and manufacturing aspects of the industry and a broad range of problem areas.

Miniature oxygen-limiting silos are being used to study the effects of dry matter content and length of ensiling on alfalfa nutrients. Preliminary results show that the nutrient and protein makeup are reduced in alfalfa ensiled after 50 percent dry matter.

Scientists also studied dairy cow reproduction and learned that proper functioning of uterine cells, which maintain the embryos, depends on a delicate balance of estrogen and progesterone levels and the number of estrogen and progesterone receptors present in these cells. Test results should provide answers to questions about embryo deaths.

Research was also conducted on milk replacer powders fed to dairy cows. Results showed that total weight gain through six weeks of age was not affected by the different dietary treatments. However, cases of digestive upset increased when more dry matter was added to milk replacer. Feeding options did not affect calf performance.

Dairy scientists also examined milk sugar lactose in blue cheese to see how the element affects quality. Results indicated there are no differences in quality of cheeses made from milks of different lactose levels.

**Entomology, Fisheries and Wildlife**

Entomologists continue to search for new ways to control insects harmful to crops, animals and humans. Wildlife and fisheries biologists look for ways to better produce or protect wildlife or aquatic life with economic importance — or potential importance — for the State.

Clemson entomologists traveled to foreign soybean growing countries to search for beneficial insects and diseases that may help control insect pests in the Southeast United States' soybean fields. Diseased and parasitized insects came from Australia, Thailand, Brazil and Argentina. Several new viral pathogens and a protozoan pathogen were isolated. Laboratory tests have shown that these diseases, which do not occur in the Southeast, are effective against soybean pests like the corn earworm, soybean looper and velvetbean caterpillar. Field tests will be conducted
and possibly become valuable links in a soybean pest management system.

Insecticide resistance in insect pests, a dilemma that confronts both agricultural and public health entomologists worldwide, is being examined as it relates to South Carolina fields crops like cotton. The tobacco budworm, a major cotton and tobacco pest, has been tested and found resistant to methyl parathion, an insecticide commonly used on cotton since the mid-1960s. This pest’s susceptibility to the newer synthetic pyrethroid insecticides is being monitored to alert growers in case a resistance develops to these chemicals.

Other field crop pests, including the soybean looper and the fall army worm, have been tested for susceptibility to several insecticides. Researchers are trying to identify the biochemical resistance mechanisms in these pests and examine countermeasures for resistance.

The worldwide demand for eels has lead to renewed interest in wild and cultured stocks of the American eel. But one of the most serious problems that awaits the eel farmer is parasites and diseases. Researchers collected eels from the Cooper River and established new host records for nine parasite species. Ten species were recorded for the first time in the South.

Food Science

Food scientists investigate proteins and factors that influence food utilization.

Commercial food producers could use more soybean and whey proteins if new technology were available to isolate the proteins and retain flavor, color and functionality. New methods, including ion exchange and activated carbon removal of flavor, show that these methods can improve the acceptability of proteins from soybeans.

The availability of protein nutrients to humans and animals is of widespread interest. Food scientists developed a new, more accurate chemical method of checking the presence of the amino acid lysine in vegetable and animal protein sources.

Research also showed that restricting sodium in rats during gestation caused brain damage in offspring. Feeding sucrose or starch to rabbits decreased hair chromium concentration. Sucrose also caused an increase in plasma cholesterol, compared to corn starch.

A study on hypertension in adolescents and young adults showed increased blood pressure associated with increased height, weight and age. Higher blood pressure was also linked to coffee consumption. Increased hair selenium, zinc concentrations and lower blood pressure were also connected. Increased hair lead was associated with higher blood pressure. The information suggested hair mineral concentrations are linked to blood pressure changes.

Ongoing research showed that intestinal parasites interfere with nu-
trient absorption. Iron and manganese absorption is decreased during severe phases of intestinal infection, but at the onset the absorption of these nutrients is often increased to twice the normal amounts.

**Home Economics**

The School of Consumer Science and Allied Professions at Winthrop College conducts research in family and child development, home economics education, nutrition, textiles and interior design.

An interior design faculty member participated in the multidisciplinary project on the design of a solar greenhouse residence with the Rural Housing Research Unit at Clemson. The objective was to design a residence that would incorporate practical and livable low-energy alternatives to traditional housing and be marketable. Winthrop faculty are assisting in space planning and furnishing recommendations, using textile research when considering upholstery, window treatments and carpeting.

Winthrop faculty participated in a regional research project on the nutritional status of adolescent girls. The eight-state study related 12, 14 and 16-year-old girls' nutritional health to socioeconomic factors, food habits, nutrition knowledge, behavioral characteristics, physiological development and other factors. Data will be combined with other states' findings.

The study of the relationship between nutrition education in elementary schools and school lunch plate waste was continued. Preliminary data indicated that caloric values varied from 500 to 900 for the same meal. These findings may indicate greater waste among schools serving meals containing greater calories.

**Horticulture**

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

Rooted peach cuttings planted in a high density meadow system of 3,000 to 8,000 trees per hectare grew well and produced a crop 14 months after planting. Tests are under way to increase flowering and productivity.

Chemical thinning of peaches was obtained with sprays of CGA 15281 and GAF 7767-141. Research is being conducted to provide more uniform coverage to improve thinning uniformity.

The Turfgrass Research Area, relocated on a three-acre plot in the Horticultural Gardens two years ago, was expanded this year to include two experimental putting greens for warm and cool season research and variety evaluations. Studies were begun to check nitrogen requirements of turfgrasses used on lawns, athletic fields and golf courses. Clemfine, a turf-type tall fescue, is a recent variety released from this program.
A sweet potato biomass study was begun in spring 1980 at the Edisto Experiment Station. A breeding study, in cooperation with the U.S. Department of Agriculture, saw five advanced germ plasm lines released as breeding lines. Two advanced lines were introduced into the national variety trials and one was ranked among top performances. Soil insect control studies revealed that following preplant pesticide applications with a second application six weeks later is economically feasible.

Researchers at the Sandhill Experiment Station are studying optimum irrigation methods to maximize production and water use and minimize moisture stress and nutrient leaching. Sandhill scientists are also studying how fertilizer placement, application, time of application and form of application affect crops and nutrients.

Multiple-cropping systems are being studied to improve land-use efficiency. Research is being conducted into planting dates and plant spacing. Variety trials are examining yield, rate of growth, days to maturity and market quality.

The relationship between seed quality, nutrient uptake, seedling development and stand establishment is also being studied at the Sandhill Station. Horticulturists are initially looking at this problem in relation to the nutritional status of the unimbibed seed and the nutrient availability of the developing seedling.

**Plant Pathology and Physiology**

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

A major goal for breeding white clover varieties is development of a variety that maintains a stand for several years. One way to increase yields and longevity is to develop varieties resistant to viruses. Researchers found that the peanut stunt virus is more harmful to white clover growth than several other viruses.

During 1979-80 water samples were analyzed for the soil fumigant nematicide 1,2-dibromo-3-chloropropane (DBCP). In areas of the State where DBCP is not used, levels ranged from nondetectable to .05 parts per billion — the level considered to be background. No municipal water sampled contained more DBCP than the background level. Through normal agricultural practices, very low levels of DBCP might get into the underground water system. Relatively large amounts of the chemical can get into shallow underground water if the fumigant is mishandled.

Diuron, a herbicide used to control aquatic weeds, does not persist when successive applications are made. The herbicide is degraded rapidly by microorganisms living in pond sediment. Products formed have little or no herbicidal activity. Diuron does not persist in the aquatic environment and poses no potential pollution problems.
Tobacco mosaic virus consistently causes major losses of tobacco yield and quality. TMV is transmitted by hands and machinery. Researchers found that the number of plants infected was greatly reduced by either washing hands in milk or soap or by wearing gloves during handling of infected plants.

Barley, oats, rye and wheat planted in untilled stubble of *servicea lespedeza* had poor seedling emergence, stunted, were chloratic, had few tillers and grew poorly. Seed treatment and soil fumigation did not alleviate the condition. When the lespedeza roots were removed, however, the small grains grew vigorously.

**Poultry Science**

Poultry scientists continue to research a wide range of problems that beset poultry producers and processors.

With increased world population and more emphasis of feeding grain to humans instead of animals, poultry researchers looked to leaves and pulpwood usually left in forests after timber harvests. Poplar and pine byproducts were adequate feed additives, but oak was unacceptable.

A bothersome aquatic weed, *Brazilian elodea*, was found to be a suitable feed additive.

Scientists also investigated cracked and broken eggs and learned that manganese increases shell strength. Low levels of dietary lead, an environmental pollutant uncommon in mineral supplements, increased shell fragility. This was counteracted by manganese. The interaction of manganese with other nutrients and its effects on shell structure are being examined.

Liver coccidiosis is one of the most damaging diseases in young rabbits. Because there are no early symptoms, the disease is difficult to detect and treatment is often useless after infection has set in. Special enzyme-related blood tests showed the disease can be diagnosed during the initial stages of infection.

**Branch Stations**

The S. C. Agricultural Experiment Station's four branch stations continued to emphasize the specialties of the areas where they are located.

The Sandhill Station at Pontiac focuses on fruit and nut tree research, along with vegetable investigations. The S. C. Swine Evaluation Center and Livestock-Poultry Health Division are located at Sandhill.

Florence's Pee Dee Station continued to expand crop research on tobacco, soybeans and corn on the site of the Pee Dee Research and Education Center for Agriculture, a complex under construction that will replace the present station.

The Coastal Station at Charleston furnished data to the Extension Service for work with vegetable growers in the Coastal Plain.
tal research is conducted at the facility, and a large Urban Research and Demonstration Area on Highway 7 South provides information to school classes, garden clubs and homeowners concerning flowers, herbs, shade trees, lawn grasses, vegetables and other plants.

The Edisto Station at Blackville aims research at the growers and cattle producers in the Upper Coastal Plain. Field crops like corn, soybeans, small grains, melons and sweet potatoes are studied, along with beef cattle.

**Active Research Projects, 1980-81**

**Agricultural Economics and Rural Sociology**
Marketing Performance of Selected Milk Pricing Systems for the Southern Region.
Economics of Peach Production in S. C.
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.
Employment Impact of Foreign Trade in S. C. and the South.
Providing Basic Agricultural Marketing Information for Program and Facility Planning.
Market for Stillage, Wet Distillers Grains and Dried Distillers Grains in S. C.
Relative Regional Shifts in Labor Productivity in S. C.
Economic Analysis of Farm Land Market in S. C.
An Economic Analysis of Alternative Marketing Strategies for Cotton Producers.
Supply, Pricing and Marketing Alternatives for Cattle, Beef Systems in the South.
Acquisition and Analysis of Census and Other Demographic Data for S. C. and the U. S.
Economic Analysis of the Potential for Increased Swine Production in S. C.
Economic Analysis of the Use of Resources on Small Farms in S. C.
Economic Analysis of Sweetener and Fruit Markets.
Market Information and the Nature of Price Dispersion in Retail Food Outlets.
Agricultural Regulation vs. Incentive Programs for Improving Water Quality.
Economies of Size in Hog Slaughtering Plants in S. C.
Economic Issues in the Conversion and Protection of Agricultural Land in S. C.
Economic Impact of Rising Energy Prices on Land and Water Resources Use in S. C.

Agricultural Engineering
Soybean Production and Management Simulation Models.
Development of Hydrologic/Water Quality Models for Agriculture and Forestry.
Automatic Controller to Improve Harvest Efficiency and Reduce Soybean Damage.
Non-Point Source Pollution From Grassed and Forested Land 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.
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.
Equipment for Mechanization of Production of Oysters and Other Shellfish.
Water Table Management for Crop Production in the Coastal Plain of S. C.
Development of Vegetable Harvesting Systems.
Mechanization of a Meadow Orchard Cultural System for Peaches.

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.
Production Practices of Flue-Cured Tobacco.
Breeding Disease-Resistant Flue-Cured Tobacco for Improved Yield, Quality and Harvesting Efficiency.
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.
Grain Yields and Field Performance of Barley, Oats, Rye and Wheat.
Cultivar Performance Evaluation of Cotton, Soybeans and Peanuts.
Cultivar Performance Evaluation of Corn and Grain Sorghum Hybrids.
Effect of Minimum Tillage and Rotation on Soybean Production in S. C.

Animal Science
Genotypic and Phenotypic Response of Crossbred Cattle Under Different Levels of Management.
EMME as a Selection Instrument for Swine.
Forage Systems for Backgrounding and Finishing Cattle.
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.
Endocrine and Immunosuppressive Mechanisms and Maternal Recognition and Pregnancy in the Beef Cow.
Biochemical Characterizations of the Porcine Stress Syndrome.
Muscle Yield and Processing and Packaging Techniques for Pork.
Wintering Horses on Bermudagrass Pastures Overseeded with Oats, Rye or Rye and Ryegrass.
Physiological Role of Relaxin During Reproductive States in the Gilt.
Reproductive Physiology of Farm Animals.
Factors Affecting the Immune Process in Cattle and Poultry.

Dairy Science
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.
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.
Influence of Ration Composition on Plasma Hormones and Lipid Metabolism in Dairy Cows.
Effect of Chemical Change in Light-Induced Off-Flavored Milk on Its Consumer Acceptance.
Physico-Chemical Properties and Usefulness of Hydrolyzed-Lactose Dairy Products.

Entomology, Fisheries and Wildlife
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 rosenbergii.
Integrated System for Suppression of Boll Weevils.
Control Tactics and Management Systems for Arthropod Pests of Soybeans.
Biology and Control of Insects Attacking Ornamental and Greenhouse Plants.
Freshwater Food Animals.
Biology and Control of Arthropods Affecting Man and Animals.
Epizootiology and Transmission of Leucocytozoonosis in Poultry.
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.
Physiopathological Relationships Between Insects and Pathogens.
Habitat of Bobcats in S. C.
Control of Tobacco Insects.
Feral Swine Movement, Habitat Utilization and Pig Survival.
Identification and Distribution of S. C. Insects of Economic Importance.
Control of Vegetable Insects in the Piedmont Area of S. C.
Biology and Control of Arthropods on Apples.
Management and Culture of Molluscan Species.
Behavior and Potential of Endemic and Imported Natural Enemies in Management of Soybean and Insect Pests.
Insect Resistant Soybean Cultivars.
Biology, Behavior, Population Dynamics and Management of Peach Insects and Mites.
Species of S. C. Termites, Their Distribution and Economic Impact.

Food Science
Composition, Nutritive Value and Stability of Poultry Meat and Egg Products.
Microbial Injury and Food Quality.
Factors Influencing Nutrient Absorption.
Nutritional Impact of Fat-Altered Diets.
Postharvest Physiology of Fruits.
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.
Development of Improved Soy and Peanut Protein Isolates.
Prediction of Nutritional Quality of Foodstuffs.
Surface Activity and Hydrolytic Enzyme Effects in Emulsion Stabilization.
Nutrient Status and Hypertension in S. C. Adolescents.
Thermal Processing of Foods Packaged in Retortable Pouches.
Functional Properties of Proteins.

Horticulture
Detection and Evaluation of Plant Growth-Environment Relationships.
Breeding Watermelons and Evaluation of Watermelon and Cantaloupe Varieties.
Improvement of Turfgrass Nutrition and Associated Management Practices.
Tea — Culture, Ecology, Propagation and Pest Control.
Growth Regulators and Orchard Designs for Production of Peaches.
Peach Breeding.
Evaluation of Strawberry Cultivars in S. C.
Nitrogen Requirements for Containerized Nursery Plants in Bark Growth Mixes.
Production, Histology, Breeding and Genetics of Mutagen-Induced Dwarf Pecans.
Evaluating and Selecting Superior Fruit Cultivars.
Vegetable Variety Testing and Improvement.
Pre- and Post-Planting Bedding Plant Experiments and Field Evaluations 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 Pot Plants.
Grape Germplasm Evaluation for Enological Utilization.
Breeding, Germ Plasm 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.
Industrial Byproducts as Container Mix Components for Plant Growing Media.
Pollination, Rootstocks, Cultivars and Physiological Problems of Apples in S. C.
Potential of S. C. Sweet Potato Cultivars for Unconventional Processes.
Breeding and Evaluation of Sweet Potatoes for Fresh Market and Industrial Uses.
Chemical Control of Soil Insect and Nematodes in Sweet Potatoes.
Cultural Management of Centipede Grass.
Characterizing and Delaying Ripening and Senescence in Peaches, Nectarines and Plums.
Use of Selected Marine Materials and Byproducts for Certain Horticultural Crops.
Evaluation, Propagation and Dissemination of Ornamental Plant Material.
Breeding Edible Southern Peas with Resistance to Insects and Disease.
Weed Control Practices for Vegetable Crops.
Urban Horticulture for Coastal S. C.
Breeding and Evaluation of Watermelon and Cantaloupe Varieties.
Breeding Disease Resistance Pumpkins for the Halloween Market in the Southeast.
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.
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.
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.
Disease Control on Vegetables.
Reduction of Aflatoxin Development in Corn by Cultural Practices and Breeding.
Biological Control of Weeds with Fungal Plant Pathogens.
Variability of Root-Knot and Cyst Nematodes and Factors Influencing Their Population Dynamics.
Contributing Factors to and Control of Peach Tree Short Life in S. C.
Etiology, Epidemiology and Control of Pecan Diseases.

Poultry Science
Composition, Nutritive Value and Stability of Poultry Meat and Egg Products.
Reproduction Characteristics and Nutritional Requirements of Guineas, Pigeons and Quail.
Eggshell Quality in Avian Species.
Semen Quality and Preservation in Turkeys and Chickens.
Serum Protein Changes in Response to the Clemson University Fowl Cholera Vaccine in Turkeys.
Partial House Brooding and Rotational Rearing in Broilers.
Protection of Domestic Poultry Against Fowl Cholera Disease Using an Avirulent Pasteurella multocida Live Vaccine.
Nutritional Factors Affecting Metabolism of Skin and Adipose Tissue in Meat-Type Birds.
Effects of Ingredients and Ingredient Processing on Production Efficiency of Meat-Type Birds.
Nutritional and Non-Nutritional Aspects of Leg Abnormalities in Turkeys and Broilers.
Endocrine and Physiological Effects of Heat Stress in Poultry.
Pathology and Control of Rabbit Liver Coccidiosis.

School of Consumer Science and Allied Professions, Winthrop College
Effects of Home Laundering on the Durability of Fabrics for Men’s Undershirts.
Career Projections and Attainment of Low Income Youth: Changes Over Time.
Nutritional Education and School Lunch Plant Waste in Elementary Schools.
Nutritional Health of Adolescent Females.
Experiment Station Publications, 1980-81

Bulletins
SB 629 — Renting and Leasing Farm Machinery. Dennis L. Thomas.
SB 631 — Interregional Analysis of a Nuclear Energy Center Showing Economic-Demographic Impact. Mark S. Henry, B. L. Dillman, Caryl Ersenkal and Tony Corey.

Circulars

Technical Bulletins
1079 — Forecast of Cotton Quality Requirements Based on End-Use Demand. C. D. Rogers, J. S. Lytle and G. J. Wells.

Research Series
Agricultural Economics and Rural Sociology

Animal Science
39 — Characteristics of Polled Hereford x Angus, Charolais x Angus, Simmental x Angus and Holstein x Angus Steers Finished on High Silage Diets. G. C. Skelley, C. E. Thompson, D. L. Cross and L. W. Grimes.
41 — Development of a Test for the Diagnosis of Pregnancy During the First Week After Conception in the Cow. Tomas Gimenez.
45 — Year to Year Variation in Birth and Weaning Weights — Edisto Experiment Station. C. E. Thompson, S. G. Woods, L. R. Allen and W. L. Skinner.
46 — Year to Year Variation in Birth-Weaning Weights — Coast Experiment Station. C. E. Thompson, G. C. Skelley, L. R. Allen, R. E. Chrestman and C. V. Nicopoulos.


All Breed Bull Sale. H. W. Webster.

Effect of Worming Treatments and Growth Stimulants in Beef Cattle On-Farm Demonstrations During Summer 1980. J. N. Williams, II.


62 — Reduced Protein, Lysine and Sulfur Amino Acids in High Fat Diets for Three-Week-Old Pigs. J. C. McConnell and J. C. Eargle.
63 — Palatability Ingredients in Young Pig Feeds as Compared to Performance. J. C. McConnell and R. C. Waldorf.

Dairy Science
66 — Dairy Herd Evaluation in Fat Content and Somatic Cells, G. E. Gramling.

Horticulture
199 — Youth Gardening Program Manual, D. P. O’Connor.
200 — Influences of Horticultural Therapy Intervention on Self-Concept of Institutionalized, Moderately Retarded Adolescents. L. E. Gillespie.
Technical Contributions
July 1, 1980 - June 30, 1981


1823 — Endogenous Hormone Response and Fertility in Dairy Heifers Treated with Norgestomet and Estradiol Valerate. G. W. Kazmer, M. A. Barnes and R. D. Halman.

1824 — Basic and Nonbasic Employment Linkages. M. Henry and S. E. Miller.

1825 — Beef Price Hedging Opportunities for Food Service Institutions. M. Henry and S. E. Miller.


1828 — The Spatial and Temporal Economic Impact of a Nuclear Energy Center — A Methodological Discourse and Application to a Southern Regional Site. M. S. Henry.


1832 — Field Evaluation of *Cinara atlantica* Feeding on Loblolly Pine Following Fertilization. W. M. Hood and R. C. Fox.

1833 — Foliage Consumption by Yellowstriped Armyworm Larvae After Parasitization by *Euplectrus plathypenae*. P. Parkman and M. Shepard.


1835 — Sensory Panel Evaluation of Pickled Eggs. J. C. Acton.

1837 — Experimental Inbreeding Depression. P. M. Burrows and G. R. Askew.


1841 — Inhibition of Larval Growth in *Spodoptera frugiperda* by Sublethal Dietary Concentrations of Insecticides. P. Parkman and M. Shepard.


1844 — Description of *Trilineellus clathrocutis* n.g., n.sp. (Tylenchorhynchinae: Tylenchida Thorne, 1949) with a Key to Species and Observations on Tylenchorhynchus sensu stricto. S. A. Lewis and A. M. Golden.


1848 — The Effects of Package Temperature and Days Storage on the Flavor Score of Processed Milk. J. J. Janzen, A. B. Bodine and J. R. Bishop.

1849 — The Effect of Urea or Soybean Meal on the Growth and Protein Status of Young Horses. R. G. Godbee and L. M. Slade.

1850 — Trifluralin Effects on Carrot Callus Tissue. M. E. Sloan and N. D. Camper.


1852 — Assessment of the Price Impact of the South Carolina Cucumber Market Order. G. J. Wells and J. F. Pittman.
1853 — In Vitro Propagation of ‘Nemaguard’ Peach Rootstock. G. A. Miller, D. C. Coston and E. G. Denny.


1858 — Four New Species of Oxyethira (Hydroptilidae) from the Southeastern United States. R. W. Kelley.


1871 — The Influence of Norethindrone on Lipid Metabolism and Cholelithiasis in Rabbits. R. F. Borgman and S. F. Lightsey.
1874 — The Response of Cuttings of *Camellia japonica* and *C. Sasanqua* to Varying Levels of Benomyl. L. W. Baxter, Jr., S. G. Fagan and M. G. Owen.
1876 — Inoculum Sources for *Monilinia fructicola* in South Carolina Peach Orchards. F. A. Landgraf and E. I. Zehr.
1881 — Residual Effectiveness of Postemergence Band Applications of Insecticides Against the Southern Corn Billbug on Corn. J. A. DuRant.
1882 — Redescription and Type Designation of *Tylenchorhynchus cylindricus* Cobb, 1913. S. A. Lewis and A. M. Golden.
1887 — Four-Year Study of the Effects on Groundwater from a Dairy Lagoon in the Piedmont. R. O. Hegg, T. G. King and J. J. Janzen.

1890 — Countermeasures for Insecticide Resistance. T. M. Brown.


1893 — Alachlor and Metolachlor Effects on Growth and Hydrolytic Enzyme Activity in Germinating Wheat, Soybeans and Squash. J. S. Hsu and N. D. Camper.


1895 — An Animated Grain Drying Model. J. M. Bunn.


1897 — Evaluation of Tilapia (Sarotherodon mossambicus) as a Substitute Fish Meal for Fish Diets. J. W. Foltz, J. M. Gibson and J. T. Windell.

1898 — Effectiveness of Certain Nematicides for Control of Macroposthonia xenoplax and Short Life of Peach Trees. E. I. Zehr and S. A. Lewis.


1901 — Fertility and Hormone Response After Lutalyse and GnRh. G. W. Kazmer, M. A. Barnes and R. D. Halman.


1903 — Turkey Liverwurst Processed with Various Meats and Meat Combinations. J. C. Acton and R. L. Dick.


1905 — Suppression of Heliothis spp. on Cotton Using Bacillus thuringiensis, Baculovirus heliothis and Two Feeding Adjuvants. D. R. Johnson. (Study sponsored by a grant from Cotton Inc.)


1909 — Hair Element Concentrations and Hypertension in South Carolina. R. Borgman and S. Lightsey.


1911 — The Effect of Sodium Restriction During Gestation on Offspring Brain Development. R. G. Bursey and M. Lisa Watson.


1913 — Registration of Pee Dee 4548 Germplasm Line of Cotton. T. W. Culp.


1919 — Use of an Electrostatic Sprayer for Cotton Insect Control. D. Manley.


1924 — Acid-Soluble Nitrogen Fractions of Pasteurized Blue Crab (Callinectes sapidus) Meat During Prolonged Storage at 4°C. L. Wicker and J. C. Acton.


1932 — Potential for Fewer Fungicide Applications to Control Cladosporium carpophilum on Peach. E. G. Lawrence and E. I. Zehr.


1934 — Environmental Effects on Development and Dissemination of Cladosporium carpophilum on Peach. E. G. Lawrence and E. I. Zehr.


1943 — Blood Pressure Studies on Young Adults. D. M. Medeiros and R. F. Borgman.
COOPERATIVE EXTENSION SERVICE
Wayne T. O'Dell, Director

As the educational outreach arm of the Clemson University College of Agricultural Sciences, the Cooperative Extension Service provides information and statewide continuing education programs that can make life easier and more enjoyable for every South Carolinian. These programs cover 16 disciplines relating to agriculture, home economics, youth and community development, programs for the economically disadvantaged in addition to general educational information. They are made possible through an agreement between Clemson University and the United States Department of Agriculture.

Created in 1914, the Extension Service is funded by federal, state and county governments as a nationwide system designed to carry education from land-grant universities to the people. For 67 years Extension has worked closely with South Carolinians helping them to a better life through dissemination of practical, useful information within its assigned areas of responsibility.

Although originally conceived to help those in rural areas, Extension has responded to changing needs by broadening its scope of activities to include urban and suburban problems.

Clemson University, through Extension, maintains an office in each county manned by county agent personnel. A professional staff of Extension subject matter specialists at the University and four Experiment Stations around the State compiles information from research and translates it into data the people of South Carolina can use day-to-day.

From basic cooking demonstrations to irrigation field tours, Extension staff members are teachers carrying Clemson University educational programs to all areas of the State.

The Extension program is organized around six broad categories: agricultural programs, 4-H and youth development, home economics, community and resource development, special programs for low income farmers, and 1890 programs conducted by South Carolina State College in cooperation with Clemson University Extension Service.

Agriculture and Natural Resources

Whether the classroom is a tobacco field, a wood lot or a farm shop, Extension activities are directed toward solving problems. Extension education tends to be informal, tailored to individual needs and budget requirements.

The delivery system is designed to deal with continuing problems as well as the unexpected and the uncommon. Consequently, the system requires substantial planning. Extension agricultural programs are relying more heavily on videotape, computers and other forms of mass communications as efficient ways to reach audiences.
When Extension began, its primary goal was improved farm production practices. Later, the importance of marketing emphasis was realized. Still later, agribusiness and international trade and government regulation demanded farmers be educated in those areas.

Agricultural and natural resource producers provide food and fiber for millions in this country and around the world. Through exceptional, efficient efforts on the part of American farmers, more people are released to help produce less basic needs. Highlights of Extension activities in the departments that deal with agriculture and natural resources at the University and in the State's 46 counties follow.

**Agricultural Engineering**

Demand for new and advanced technology in agricultural engineering continues to be great with energy conservation and utilization, irrigation, crop processing, family housing and agricultural waste management receiving particular emphasis. A new project begun in the past year concerns the use of solar energy on South Carolina farms. This project, funded by a $100,000 grant from USDA/SEA, will establish 10 on-farm demonstrations of solar energy collection and utilization for grain and tobacco drying.

In 1980 about 85,000 acres of South Carolina croplands were irrigated, a 10,000-acre increase over the previous year. Educational efforts stressed the need for increased management by farmers using irrigation. These included in-service training of county Extension agents, field demonstrations and tours for farmers, and training sessions for irrigation dealers.

Educational programs were significantly expanded on energy use in both agriculture and the home. These emphasized improved energy management and utilization of renewable fuels where practical. Educational aids developed include an Energy Reference Guide for Agriculture and a slide-cassette set for training rural residents. Programs included on-farm production of alcohol, use of wood for process heat, and agent training in energy management.

Safety programs included initiation and conduct of a statewide farm accident survey to direct future educational programming. Strong programs continued in home heating with wood as well as a new one for training emergency medical service technicians in farm accidents.

Residential housing activities and program efforts this year centered around factors that affect economics or cut housing costs. Do-it-yourself home repair has attracted large audiences of homeowners seeking to avoid service calls. Wood burning has continued to be an area of strong interest.

A do-it-yourself solar water heater design was developed for the Extension Plan Service. This unit uses a commercial flat plate collector.
mounted below the water heater to utilize thermosiphoning of the hot water from the collector into an elevated tank.

During the year plans for six modern houses incorporating energy efficiency and low-cost construction were developed. These plans were publicized in Extension circular 614, through meetings with the Home Builders Associations of South Carolina, and through a series of newspaper articles. A waste management program recently initiated will study eight poultry layer anaerobic manure lagoons to determine if undesirable odor production can be related to easily measured lagoon characteristics.

South Carolina’s land and water quality educational program was initiated in 1980-81. The goal is to control non-point source pollution of agricultural origin and thus improve water quality and reduce soil erosion. A major accomplishment of this program nationwide has been a study to ascertain the extent of educational aids already available. This study resulted in a compendium on the subject of non-point source pollution control that serves not only as an effective base for the South Carolina Land and Water Quality Program, but also for programs of national scope.

In farm power machinery, a wide range of training topics illustrates the breadth or demand for production assistance. Sprayer calibration, tractor efficiency, dynamotor use, non-till production technology, and use of computers for decision making were all topics covered in training of county Extension agents. Two hay day programs, a herbicide incorporation and energy conservation field day, and a no-till demonstration on row crops were held during the year.

Agronomy

Crop production is changing rapidly and requires constant updating. Through its staff at the University and in 46 county offices, Extension Agronomy provides up-to-date field crop production recommendations based on research and field experience.

Soil and plant analysis, provided by the new Agricultural Service Laboratory, forms the basis for fertilizer recommendations for agronomic crops. More than 82,000 soil samples were analyzed by the laboratory this past year.

Extension Agronomy educational programs are conducted at the State, regional and local levels. Within the past year, production of agronomic crops was discussed and illustrated with slides at four statewide, seven regional and 74 county meetings. Three crop tours were conducted, eight training meetings were held for Extension agents, and 101 on-farm test demonstrations of crop production practices were conducted. Demonstrations involved soybean, peanut, grain sorghum and cotton variety comparisons; weed control in cotton, corn, soybeans, tobacco, peanuts and wheat; forage management; fertility
trials in corn, cotton and soybeans; cotton growth regulators and defoliants; and other field crop production practices.

The latest crop production practices are detailed in publications such as circulars, bulletins, leaflets and newsletters. These are distributed as needed through county Extension offices.

Other educational programs are conducted through newspapers, radio and television to provide timely information on specific crops and practices. The main objective is to improve quality, yield and profitability of South Carolina field crops.

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 expectation of profit. Superior management and marketing are keys to realizing these expectations.

Special beef calf markets are increasing, as are total numbers of calves offered. One special sale involving 400 head and 140 head of calves shipped directly initiated a new marketing effort in the fall of 1979. Four special sales and 2,986 calves highlighted marketing efforts in 1980. A half dozen sales are planned in 1981.

Strong beef cattle markets depend on offerings of high quality, well-managed cattle. 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 year.

Producers in Chester, Lancaster and York counties organized to form the Tri-County Cattle Marketing Association. Greenwood, Abbeville, Saluda, McCormick and Edgefield counties make up the Palmetto Livestock Marketing Association. These, as well as Laurens, Lugoff and Buckfield Plantation sales, are built around improved quality and uniformity.

The South Carolina Gain-Tested Bull Sale held in February featured eight 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, 600,000 swine were sold in 1980, excluding inter-farm sales. About 60 tested boars were sold at the Swine Evaluation Center. These offered performance, quality and sound features unequaled in the State. Extension Animal Science is trying to initiate and expand on-farm testing of swine. Approximately 10 herds were enrolled during 1980-81.

There are 66,000 horses in the State, with well over $150 million invested in horses, land, equipment and buildings. Extension education in this area focuses on youth but also reaches a limited number of adults.
Dairy Science

Extension Dairy Science personnel continue to work with dairy farmers, dairy organizations and related businesses to provide consumer educational material for this important agribusiness.

Following the summer of 1980, one of the hottest and driest in recent history, educational efforts were developed to help dairymen overcome a severe shortage of feed for dairy herds. Ten meetings were conducted with more than 150 producers, Extension agents and others attending. Information on dealing with the situation was presented. In addition to the meetings, Extension agents visited more than 150 dairy producers to help with feeding program adjustments.

Due to the drought, a tremendous amount of interest exists in small grain silage for dairies. Responding to this interest, three small grain silage seminars were conducted at Sumter, Orangeburg and Clinton with more than 225 persons attending. A small grain silage survey was conducted after silage harvest and silage quality of the 1981 crop was measured through chemical tests, and a summary is being compiled.

Extension personnel worked with 100 dairy producers on computerized feeding programs and the use of mixer-weigh wagons. The South Carolina Forage and Grain Testing Program continues to be an excellent educational tool for producers. More than 600 feed and forage samples were submitted for nutritional analyses. The Agricultural Service Laboratory opened during the year and has analyzed more than 200 samples.

A short course on reproductive efficiency was developed and presented at 13 locations. Topics included artificial insemination and reproductive function, estrous synchronization of heifers, use of reproductive records, prevention of reproductive problems and nutrition as it relates to reproduction. More than 500 dairymen representing 100 dairies attended the sessions.

Extension dairy specialists worked with many South Carolina dairymen concerning mastitis prevention and control, milking management and procedures, and milking system analysis.

The Dairy Herd Improvement (DHI) program has had a large impact on cow performance and profitability in South Carolina herds as shown below.

<table>
<thead>
<tr>
<th></th>
<th>No. Herds</th>
<th>No. Cows</th>
<th>Annual Production/Cow (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All cows</td>
<td>360</td>
<td>48,000</td>
<td>11,188</td>
</tr>
<tr>
<td>DHI cows</td>
<td>246</td>
<td>32,145</td>
<td>13,335</td>
</tr>
<tr>
<td>Non-DHI</td>
<td>114</td>
<td>15,855</td>
<td>6,835</td>
</tr>
</tbody>
</table>
The figures on all cows are from the South Carolina Crop and Livestock Reporting Service, June 1981. They show the production of DHI cows is almost double that of cows in non-DHI herds.

A special session on antibiotics in milk was held so agents could alert producers of the problems antibiotics in milk can cause.

Two sessions of the Veterinary Large Animal Academy were held. The fall session dealt with the health aspects of feeding cows. Twenty-eight veterinarians attended and received updated information on the causes of abomasums, grass tetany and milk fever.

**Entomology, Fisheries and Wildlife**

The departmental name was changed from Entomology and Economic Zoology to Entomology, Fisheries and Wildlife. This change will enable the public to better understand the missions and role of the department.

Extension entomologists are continuing successful Integrated Pest Management (IPM) programs in soybean, tobacco, cotton, tomato, peach and apple crops. New techniques to assist growers include the use of pheromone (sex hormone) and light traps for early warning of insect outbreaks. The toll-free INSECT HOTLINE in the Pee Dee and Savannah Valley regions of the State provides current information on crop insects. A pilot computer program is being tested in the Savannah Valley district (from the Edisto Station) to provide electronic transmission of insect data to counties for Extension agent use.

Dairy farmers in the Piedmont are switching from corn to more drought-tolerant sorghum for forage feed. Fall armyworm and other insects are proving to be a serious problem in sorghum production. A major effort is under way in Newberry County to work out damage thresholds (where treatment is needed) and effective control practices for sorghum insect pests.

A recent study of on-farm stored grain procedures and practices in South Carolina revealed that farmers are suffering heavy losses in stored commodities to grain-damaging insects. Efforts are under way to train farmers to better protect their stored commodities and to reduce these losses.

Extension Entomology continues to provide leadership in pesticide training programs in the State. A new program gaining importance is pesticide impact assessment. A full-time entomologist has the responsibility for this joint Research-Extension program which will provide use and benefit information on essential pesticides considered by EPA as high risk and which could be removed from the marketplace.

Programs in the fisheries and wildlife area continue to put great pressure on our one Extension specialist in these disciplines. Fish farming (aquaculture) is a program area of great promise considering the 40,000-plus farm ponds in South Carolina. Game management, animal
damage control (beaver, deer, etc.) and youth programs are in great demand by the public.

Another area in high demand is pest control for homeowners. Currently, programs are extended to the public through the media, publications and training of commercial pest control companies.

**Food Science**

More than 4,150 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 crab processing company to adopt revised processing procedures that reduced steam energy usage by more than 55 percent without impairing product quality or yield. Additional savings were realized with the adoption of new crab picking sanitation recommendations resulting in longer product shelf-life reflected by a 90 percent reduction in microbiological counts for the product immediately after picking.

In another area, Food Science recommendations were incorporated into the design of South Carolina's first canned green and red pepper processing plant to begin operation in July 1981.

Food scientists assisted in the feasibility evaluation of several "new venture" food processing operations that were considered by South Carolinians. Included were the manufacture of barbecue sauces, country cured ham and sausages, frozen boiled peanuts, frozen dressed catfish, and construction of a commercial food preservation center/complex in Florence County. On-site good manufacturing practice advisories were provided to 13 community canneries, and the layout design was developed for a new cannery under construction on St. Helena Island by the Beaufort-Jasper County EOC.

In other projects, food scientists developed educational radio, television and news releases on food safety, food additives and food labeling; organized a statewide food industry association conference; provided leadership in several food processing trade and professional associations; and served as the Institute of Food Technologists regional communication to South Carolina.

**Forestry**

Two new publications during the past year are "Selling Timber: The Ultimate Forest Management Decision" and "Growing and Marketing
Christmas Trees in South Carolina." Both have been well received by people in the State.

Marketing continues to be a problem for South Carolina landowners. The marketing publication listed above, along with a monthly price reporting system which has been available to each county Extension office for the past two years, helps the landowner gain more profit from his timber crop. The monthly price reporting information available in the county offices is used by various agents to stimulate interest among the landowners and to encourage them to ask for additional information on how to market timber.

The 1978 Renewable Resources Extension Act called for greater involvement by Extension natural resource personnel in educating professional audience groups for the various disciplines. During this past year, Extension Forestry has initiated a forestry forum series for professional foresters. The first forum was held in March and was very well received. Plans have been made to hold another forum. Workshops for professional groups like consulting foresters are also being developed, and other courses will be developed for various professional interest groups.

Approximately 10 percent of forest landowners in South Carolina are minority landowners. To reach more of these people, Extension Forestry, in conjunction with South Carolina State College 1890 Extension and the South Carolina Forest Commission, has initiated a minority landowner contactor program. Two pilot counties, Hampton and Orangeburg, have been selected for 1981.

Three meetings and workshops were held to coordinate the activities of the various agencies which can help make this program a success. In addition, a contactor training program was held in June. Contactors will be working with landowners over the next year and, as clientele lists are developed, workshops will be held for this group. The program will be monitored closely and will be expanded to other counties as its success grows.

The competitive educational and fun events staged at Clemson for young people from six counties last year indicated this program has excellent opportunity for statewide development. Three successful field days were held in the State in the fall. Additional field days have been planned, as well as a statewide contest for the winners from the three district events. Plans are also under way to coordinate this program with the National 4-H Forestry Invitational.

Horticulture

Extension Horticulture is responsible for disseminating information on fruits, vegetables and ornamental crops in South Carolina. The unit is primarily production oriented, but also is involved in post-harvest handling and marketing.
South Carolina residents are becoming more interested in home horticulture programs. More than 300,000 families have home vegetable gardens, and even more are requesting assistance in ornamental production. Extension programs have helped a large percentage of these families through direct contact, mass media and more than 200,000 home horticulture publications. In an effort to more efficiently serve this large number of clientele, Extension has established a master garden program to train volunteers to help the public.

New crop development has been a part of commercial agriculture programs, as well as small farm programs. South Carolina farmers now have 80,000 acres of irrigated crop land. At least half is automated and only used for a small portion of the year. Through individual contacts, group meetings and demonstrations, Extension has addressed the problem with economic analysis and cropping patterns.

Small farm programs in vegetables and small fruits have been offered in 46 counties, and direct-to-consumer markets have been established in 30 counties. Nine area agents work exclusively with small farmers.

Pest management programs with peaches and tomatoes have received 100 percent financial support. Apple programs are still being developed. Studies of the fruit quality implications of pest management will continue. 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.

Drip irrigation demonstrations have convinced a number of growers to convert to this energy-saving tool. Statewide short courses on this subject have reached approximately 90 percent of the growers of turf, pecans, nursery crops and flowers.

Peach production in South Carolina is a $60 million industry. Peach production and marketing programs help growers produce a more economical crop and be better informed about its market. The "Peach Report" is a tool used to help growers and markets communicate.

Marine Advisory Service

LORAN conversion workshops were held by Marine Advisory Services in four locations. Fishermen came away with more than 4,500 coordinate reconversions, thus saving themselves the considerable amount of time it would take to reconvert these plots individually.

To inform the State's commercial banking industry about federal guarantees and tax incentives for commercial fishermen, the Marine Advisory Service and the Agricultural Economics Department at Clemson, along with the South Carolina Bankers Association, sponsored a conference in November 1980 attended by 52 commercial banking people.

Because of the shortage of safe and efficient commercial fishing boats,
the Marine Advisory Service constructed a traditional boat out of "C-flex" fiberglass planking in a Beaufort boatyard. Total construction costs were approximately $1,500. Several small boat fishermen have since ordered materials and built boats for themselves. One was a traditional wooden boat builder who has now switched materials and has constructed four boats with orders for 10 more. At present, 15 boats of this design and technique have been constructed and are in use.

Approximately 60 requests for information on federal tax incentives and NMFS loan guarantee programs were handled by Marine Advisory Service specialists.

As a result of frequent needless hospital treatment of minor fishing accidents, the Marine Advisory specialist in Georgetown initiated an experimental program with local physicians to treat victims of minor accidents as outpatients rather than hospital admissions.

The fifth Tropical and Subtropical Fisheries Technological Conference of the Americas, held in the spring in Charleston, was co-sponsored by Marine Advisory Services and the Southeast Fisheries Center (NMFS). Eighty-five seafood technology researchers, home economists and industry representatives from the South Atlantic, Gulf Coast and Caribbean exchanged ideas and discussed future considerations at the meeting.

As the culture of various aquatic species (Macrobrachium, clam, crawfish, eel) becomes more feasible, requests for information on viable aquaculture ventures have increased. The Marine Advisory specialist in aquaculture is completing work on a sea grant publication, "Aquaculture in South Carolina: The State of the Art," which will give an introduction to the industry, potential species, techniques, costs and benefits, and status of research.

The demand for information on culture of hard clams for personal consumption and supplemental income is increasing. As a result, the aquaculture specialist established three hard clam gardening demonstration plots in different locations in December 1980. Work will continue on these projects.

Scuba diving shops and diving clubs have enthusiastically supported and helped coordinate past Marine Advisory Services diving workshops. This year more than 150 persons attended sessions on diving safety, new equipment and diving spots.

Marine Advisory Services specialists were notified by park managers, bait dealers and convenience store operators that most coastal park visitors need basic information on where to fish, what bait to use, hook size, etc. A brief fishing guide to the Hunting Island State Park, the most heavily visited park in the State, has since been completed. The South Carolina Department of Parks, Recreation and Tourism is underwriting the publishing costs.

Hurricanes, or remnants of them, wreak havoc on South Carolina's
shoreline almost every year. Coastal property owners not only have to ensure their personal safety, but must contend with property damage and beach erosion after the storm. In the aftermath of Hurricane David in 1979, Marine Advisory Services held three seacoast plant seminars to inform the public on the proper use of natural cover for dune stabilization and beautification. One hundred landscape architects, planners and developers attended.

**Plant Pathology**

Integrated Pest Management (IPM) programs continued on fruit (peach and apple), field crops (tobacco, cotton, soybeans and peanuts) and vegetables (tomato). A pilot program designed to cut pesticide use on peaches demonstrated that reductions of 20 to 40 percent are possible for certain pesticides, provided growers follow prescribed practices and meet certain management criteria. A 50 percent increase in apple grower participation in IPM programs resulted in significant reductions in pesticide use and overall costs for more growers.

IPM programs on tobacco were expanded into two pilot counties. Many tobacco fields routinely treated with a nematicide were found to be treated unnecessarily, or the nematode situations were such that use of varieties with nematode resistance and/or use of other nonchemical controls could suffice. IPM programs for cotton and soybeans centered on identification of nematode problem areas on scouted farms. The same was true for peanuts. Additionally, a system was introduced to help peanut growers evaluate the status of leaf spot diseases. Tomato growers on IPM programs continue to use less fungicides where practical.

Nematode threshold guidelines were prepared for distribution to county agents, specialists and crop consultants. Guidelines were also prepared for distribution to soybean producers to help with decisions on foliar fungicides for soybean disease control.

Evaluation of computer programs with the objectives of providing prompt, more complete and reliable information on diseases and controls, is in progress for peaches, apples and peanuts. Additional programs are planned for nematodes of several crops. The new Agriculture Service Nematode Laboratory will be the primary facility for obtaining data on nematodes for computer use.

Efforts to reduce costs of disease controls have increased through IPM programs and by demonstrations to show where cost cuts are possible. One example involving nematode control on golf courses shows the average cost to exceed $12,000 annually. A program is under way to show where these costs can be reduced 60 to 75 percent.

Significant improvements were made with new, full-time management for the Plant Problem Clinic. More clinical tests are now used in the diagnosis processes. The clinic serves to help county Extension agents solve problems for growers as well as monitor disease and other
plant problems in the State. Approximately 5,000 specimens are processed annually. The number should increase as additional planned improvements are made. Several fruit diseases have recently been discovered through clinic and IPM-coordinated activities.

Several fungicides and nematicides were added to the list of needed pesticides for South Carolina growers through the efforts of Extension pathologists and the pesticide industry. State pesticide regulations were used to obtain “local needs” (24C) and section 18 “emergency” labels.

Seventy-five illustrated fact sheets on plant diseases were prepared and printed during the year.

**Poultry Science**

Integrated egg producers have received guidance from Extension poultry scientists concerning pre-cooked egg products. A poultry specialist helped one egg producer with plant and equipment design, ingredients, packaging and quality control of hard-cooked, peeled eggs preserved in citric acid and sodium benzoate. Marketing of this new product is progressing satisfactorily, and the plant has added new employees from an abundant labor pool.

Through efforts of the Poultry Science Department, in cooperation with the South Carolina Poultry Improvement Association, South Carolina was certified as a pullorum-typhoid clean state in accordance with the provisions of the National Poultry Improvement Plan. Efforts to maintain this status are continuing as evidenced by the licensing of 69 bloodtesters in the State.

Members of the South Carolina Poultry Serviceman’s Association received state-of-the-art information on poultry health and management at semi-monthly meetings conducted by poultry specialists. The Clemson University Poultry Health and Management short course attracted about 90 participants from South Carolina and other Southeastern states.

Poultry production management meetings were held in Saluda, Abbeville, Lexington and Sumter counties for more than 150 broiler, egg and turkey growers.

Successful field trials were conducted on feeding cage layer wastes as an alternate nitrogen source for beef cattle. Fifteen producers are applying these results in poultry/cattle operations.

Information on commercial production needs, contracting and cash flow was provided to potential turkey, broiler and egg producers. Extensive advice and literature were provided to hundreds of individuals with interests in rabbits, quail, pheasants, bantams and other hobby breeds. The demand for this information was such that all associated bulletins were depleted and had to be reprinted.

Extension Poultry Science specialists participated in several demonstrations, television interviews and other media presentations to pro-
vide the general public with information on poultry and poultry products. Poultry Science personnel assisted with the State chicken cooking contest, several omelet preparations, turkey smoking and carving demonstrations, and poultry barbecues to promote consumer awareness of the economic and nutritional value of poultry products.

**Production-Marketing Economics**

Providing educational programs and training to farmers, agribusinesses, Extension agents and the public about agricultural marketing, farm 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.

The major thrust of Extension Production-Marketing Economics in 1980-81 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 help managers improve their information base and ability to make decisions and manage risks: 15 marketing workshops and seminars; 14 farm management workshops and seminars; 26 outlook presentations; 22 county meetings on agricultural policy, income taxes, estate planning, farm management and marketing; five training sessions with agricultural lenders; four training sessions for county Extension agents on farm management, marketing and policy; several management sessions for low-income and commercial cooperatives; five schools for tax practitioners (650 participants); and numerous county visits for consulting with farmers.

Literature development was a major educational emphasis. Economic issues impacting on agriculture were discussed in "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.

Enterprise budgets for the major crops and livestock enterprises were prepared and used extensively in production, policy, financial lending and marketing decisions. Additionally, 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 alterna-
tives before making commitments. Computer programs for vegetables, fruits, 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 1980-81. More than 50 programs were developed for microcomputers. A farm records program and an accounting program for tomato packing sheds are being field tested. Extension’s work with microcomputers is increasing and has gained national recognition.

Due to increased demand for assistance, special emphasis was given to marketing and farm management programs in grain marketing, dairying and farm credit. A grant from SEA/Extension was obtained to study the alternative sources of farm credit. This study will be completed in 1982-83.

Community Development

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 helping community leaders, governing officials, organizations and professionals in other agencies understand and solve community problems and obtain maximum benefits from community resources through wise utilization.

In 1980-81 surveys were conducted in seven communities. Meetings to present survey results drew 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.

A one-day training session in leadership development was given to the governor’s staff in community development.

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.
Extension and the Soil Conservation Service continued to conduct educational programs in Resource and Conservation Development (RC&D). Three television shows were presented and 15 county meetings were conducted with local leaders on RC&D issues.

Meetings were conducted with local governments and community leaders on the impact of economic development and planning on land use in urban and rural areas. Specialists assisted the Governor’s Council on Rural Development in conducting three regional hearings on rural development and also served as resource persons to several task forces. Two meetings on public policies affecting land use were held with farmers. Specialists continued to help state agencies and other organizations present educational programs on land use and community planning.

A fiscal impact model and users’ manual have been developed to help communities analyze the financial impact of providing necessary community services for proposed industrial development. The model was used by three communities in 1980-81.

Classification and compensation studies were prepared for six rural communities. These studies help local governments establish job descriptions and compensation schedules for personnel.

Several computer programs (including micro-computers) have been developed for use by local government. An EMS program has been used by three towns in evaluating the cost effectiveness of emergency medical service.

Other work with local governments included assistance to several rural towns in analyzing the community tax base and revenue potential, developing operating and capital budgets, developing rural fire protection organizations, and analyzing land regulation ordinances.

Circulation of the Extension CD newsletter has increased to 1,500 monthly. Video tapes were produced on leadership surveys, community industrial development and land-use planning. New publications have been prepared on CD programs and land use.

Federal Assistance Programs Retrieval System (FAPRS) brochure applications were revised, and use of this service is continuing.

**Extension Home Activities**

**Scope of Activity**

Home economics deals with man’s physical environment and his nature as a social being. The interrelatedness of these components and the significance of their relationships require an interdisciplinary approach to problem solving.

Extension Home Economics through the land-grant university is organized around five subject matter areas: child development and family relations, clothing and textiles, family resource management,
food and nutrition, interior design, and housing. Information is delivered through county agents in each of the 46 counties.

For many adults, Extension has provided opportunities for life-long learning. Local agents are a recognized source of reliable and objective home economics information. This knowledge base is supported by a staff of state specialists in each subject matter area, the United States Department of Agriculture, and the Federal Extension Service. Research is carried out and pertinent data secured. Specialists interpret and relate research findings, trends and data to the problems of South Carolina individuals and families.

As a result of Extension Home Economics education, families and individuals are more able to identify their needs and opportunities, make informed decisions, utilize resources and acquire needed competencies to live more effectively in a complex world.

A brief overview of each subject matter area for 1980-81 follows:

**Child Development and Family Relations**

The Extension Child Development and Family Relations program is becoming more widely recognized by South Carolinians. County agents and the state specialist are being called on to produce more and more programs and workshops; more requests for publications are coming in. In these inflationary times, people are calling on Extension to help them learn how to help themselves. People seek information on parenting skills, dealing with stress, strengthening families, teen pregnancy prevention, and drug and alcohol abuse prevention. Programs were conducted in all areas of family life for special interest groups, Extension Homemaker Clubs and 4-H Clubs.

Popular home study courses for parents have been Baby Talk, Pointers for Parents and Preschoolers, and I Am A Person for parents of children 6-12 years of age. Baby Talk alone has been used by 4,000 families since January.

The Parent/Child Interaction project is expanding to 40 counties and continues to reach hundreds of families with young children.

As a result of having been the lead agency for the White House Conference in South Carolina in March 1980, Extension is still involved in related programs and projects. Some of these are:

1. Articles were written on the most crucial problems families face.
2. Teen pregnancy prevention programs were coordinated by school systems, by Extension, and by county health departments.
3. Parenting workshops were held in some stores with the businesses supplying advertisement and facility arrangements. More than 780 people have been reached.
4. A drive to inform the public of services which agencies offer to families was under way in one county.
5. An interagency committee is working on abuse in the family, and also sponsored a seminar in April using money from a DSS grant.
6. A telephone helpline is being installed in one county for victims of family violence.
7. Programs for expectant mothers have been initiated.
8. Many programs on fighting inflation were held.
9. In Berkeley County, the county council has long-range plans to implement a hotline for agency services.
10. A guardian ad litem advisory board was appointed to work with family court judges in Darlington County.

The family life and child development specialist arranged in-service training for agents on parent-teen relations in two state correctional institutions for youthful offenders.

**Clothing and Textiles**

Coping with inflation continues to be the major area of emphasis for the Clothing and Textiles programs. The area of wardrobe planning and coordination had been one of the major efforts this year, with 124 Extension home economists being trained in the area. Four videotapes and four slide sets were produced in wardrobe planning to meet the needs of most clientele. Another program was developed on figure proportion. Showing people how to update last year's wardrobe and take factory damaged linens and turn them into very attractive items received attention. A kit on applique was developed for county use.

Fifteen county Extension home economists were trained in the basics of textiles to prepare them to help consumers select and care for apparel. In support of this program, four videotapes were prepared. This past year, five sewing consultants taught at senior citizen centers, fabric stores and in their homes. Twenty-two counties have provided speed tailoring workshops to help experienced sewers.

In the youth phase of our programs, drafts of four project manuals have been completed. The fashion clinic, 4-H fashion review, and clothing demonstration programs have directly taught 155 4-H'ers and adults about fashion, poise and clothing construction. Four television programs, nine radio programs and 73 news articles were prepared in the clothing and textiles program. In addition, a special issue on "Management is the Key for the Fashion Minded" was sent to all the daily papers in South Carolina.

**Family Resource Management**

Inflation continued to be the number one topic of concern among groups served in the State during 1980-81. More than 50 percent of our counties have offered clientele information relative to coping with inflation. In addition, 80 percent of the counties provided basic money management material designed to better equip citizens with financial
management skills. Several study-at-home series developed and published by Clemson Extension have been widely used throughout the State.

Renewed emphasis has surfaced in the do-it-yourself ethic. Programs were held throughout the State to aid people wanting to develop such skills. Further, a Clemson Extension Service publication, "Recipes for Home Care Products," widely used in South Carolina, became a national as well as an international traveler. More than 30,000 copies of the publication were mailed upon request after a description appeared in "Changing Times."

An interdisciplinary training program was held in December 1980 involving all home economics specialists and the county staff from each of the 46 counties.

New programs developed during the year to meet needs expressed by home economists and the county advisory committees include packaged programs on time management, health insurance and children and money.

Considerable effort was expended in the 4-H consumer education program during 1980-81. The 1981-82 plans show 37 percent of the counties will teach consumer education skills to the State's young people.

Computer budgeting, a program offered by Extension for a number of years, has changed in format. Joint efforts between Radio Shack and Extension have resulted in numerous exhibits in shopping malls across the State. The free loan of computers combined with money management computer programs developed by the Clemson University state staff have produced a service for citizens of the State who need budgeting information.

**Foods 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.

Traditional methods like group special interest programs have been continued. Additionally, special efforts have been made to reach target audiences by novel methods: busy homemakers through the home study courses "Learning About Meat" and "Preschooler and Food"; limited resource families through EFNEP home visits, group meetings and youth programs; youth through a variety of 4-H nutrition projects and lessons; visually handicapped through nutrition programs via educational radio. Radio and television were used extensively to present information on stretching the food dollar, food safety and general nutrition.

Extension Home Economics has also extended its outreach by train-
ing volunteers for 4-H and Extension Homemakers programs in food and nutrition.

**Wise Use of Food Resources** — Inflation sometimes makes necessary adjustments in food purchasing and food use practices. Programs in food purchasing, preservation and storage emphasized reducing consumer waste as one method of improving the standard of living without causing additional family stress. The back-to-basics movement, along with inflation, has caused a tremendous increase in home food preservation. Extension has primary responsibility in home food preservation in the United States. The "Home Gardening and Preservation" manual, Circular 570, has been very popular, with more than 75,000 printed in 1981 for public distribution. A new manual on "Preserving Summer's Fruits" was prepared for use next year.

**Nutritional Status Relating to Good Health** — In 1980, USDA and HHS published the "Dietary Guidelines for Healthy Americans." This year a major thrust has been made to emphasize two of the seven dietary guidelines: avoid too much sodium, and avoid too much sugar. Obesity has a direct relationship with many life threatening diseases. Eating Slim continues to be Extension's weight loss program.

**Nutritional Needs of Children** — Fun Food Facts is a USDA-CES funded program developed by a nutrition specialist at Clemson to reach preschool children and their parents with nutrition education. The program has been piloted in six counties and will be run statewide in 1981-82. The home study program Preschooler and Food is still being used by parents who are unable to attend a sequence of organized meetings.

**Expanded Food and Nutrition Education Program**

In 1969, the Expanded Food and Nutrition Education Program (EFNEP) was launched to attack the particularly widespread problem of poor diets in America.

EFNEP focuses on families with young children and those who receive food assistance. During the decade, carefully selected educational methods have resulted in EFNEP emerging as a highly successful program in changing dietary patterns, behaviors and effecting better management of total resources.

4-H EFNEP concentrates on youth between the ages of 9 to 19. Since 1969, EFNEP had reached 33 South Carolina counties. For the first six months of the current fiscal year (October 1, 1980 — March 31, 1981) 3,418 different families were involved in the adult phase and 2,919 youth were reached through 4-H EFNEP. Efforts have been continued to enhance the coordination of the adult and youth phases of EFNEP. Volunteer leaders continue to be recruited and trained to provide outreach efforts.
Interior Design

Increased awareness of the influence of the physical home environment on the individual and family has been observed this year.

Extension home economists have helped individuals create home environments which would more effectively meet their needs by offering special interest programs and training. Nine counties offered the interior design short course. Thirty-nine counties have collectively offered 77 special interest programs on care, construction and renovation of home furnishings. Twenty-two programs on selection and placement of furnishings were presented in 14 counties. Youth in 11 counties were offered the opportunity to learn about making their living environments more pleasing through 4-H programs.

Eight interior design seminars were conducted for home economists. The subject matter title of interior design has replaced that of home furnishings. This title change should aid development of public programs which will deal in a broader spectrum with the influences and importance of design and planning in our interior home environment.

Residential Housing

Extension Home Economics housing work focused on five areas during 1980-81: energy conservation, home repairs, remodeling and planning homes and/or kitchens, home heating and heating safety, and moisture control. Other housing areas in which South Carolinians received Extension assistance included home safety and security, storage, solar housing, pest and waste control, and home lighting.

Extension agents share responsibility for providing citizens with help on housing questions. Agents this year gained current housing knowledge through a regular residential housing newsletter, one-day in-service training on kitchen planning and kitchen storage, two-day in-service training on simple home repair and home storage, videotapes of educational materials available for county housing work, and in-county visits with the State housing specialists.

In 1980-81 more than 9,000 persons received housing information. In addition, 45 persons were referred to other agencies. Various Extension newsletters on housing reached an estimated 43,357 readers.

Client requests indicate future housing work will include increased emphasis on remodeling, home repairs, storage and space utilization, and housing for low and middle income, handicapped, elderly and single persons.
4-H and Youth Development

For more than 60 years the 4-H program has focused on providing opportunities for youth to develop their abilities to perform as productive, contributing members of society. The objectives of 4-H are to help young people:

1. Develop inquiring minds.
2. Learn practical skills.
3. Learn to make intelligent decisions and manage their affairs in a fast-changing world.
4. Acquire positive attitudes.
5. Develop their potential through educational and vocational experiences.
6. Improve skills in communication and self-expression.
7. Explore interpersonal relationships.
8. Maintain optimum physical and mental health.
9. Develop interest in community and public affairs.
10. Increase leadership capabilities.
11. Practice socially acceptable behavior, personal standards and values for living.
12. Use time wisely in attaining a balance in life.

Participation

In 1980, 105,106 youth participated in the 4-H program. Of that number, 46,325 were reached through community and school clubs led by 1,845 teen and adult volunteer leaders. A long-term goal of the South Carolina 4-H youth program is to expand the number of volunteer leader-led clubs. Several studies, conducted at the national level (with South Carolina participating), have shown the quality of learning that occurs in community and project clubs surpasses all other delivery systems used by the 4-H program. By 1985, it is expected that at least half the youth involved in 4-H will be reached through volunteer leader-led clubs.

Another 20,189 youth were involved in short-term (generally two to 12 weeks) special interest projects. Among the most popular were embryology, bicycle care and safety, energy and environmental conservation, electricity, and plant and animal science.

Additional contacts with youth were made through 4-H camps (7,388); educational television programs reached an estimated audience of 27,435 youth; and the 4-H component of the Expanded Food and Nutrition Education Program accounted for 4,266 youth reached.

Program Emphasis

The primary emphasis of the South Carolina 4-H youth program concerns the recruitment, training and support of adult and teen volunteer leaders. The volunteer leader concept of utilizing the skills, knowl-

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edge and experience of volunteers to provide learning opportunities for youth is essential if 4-H is to expand and enhance programming quality.

This increased emphasis on volunteer leader development is bringing about a significant change in the roles and responsibilities of Extension professionals assigned to work with 4-H in the counties. Such changes are necessary, not only for the reasons stated above, but also to assure that the tax-payers' dollars are used most judiciously.

At the national level, it has been estimated that for every public dollar expended for the 4-H program, the equivalent of ten dollars has been provided by individuals and organizations representing the private sector either through cash donations or through the commitment of time contributed by volunteer leaders.

Thus, the emerging role of county professionals is that of “managers of resources,” working with and through local volunteer leadership to serve the needs of youth. One by-product of this new role has been an increase in the cooperation existing between 4-H and other youth-serving agencies and organizations. Such cooperation is vital in assuring that youth development programs meet the needs of youth in a given area while decreasing duplication of programming efforts by various organizations and agencies. In this respect, the strengths and resources of each program can be emphasized for maximum benefits to youth.

**Special Programs**

**Scope of Activity**

Although the latest available data points out that three-fourths of the full-time farmers in South Carolina are primarily small farm operators, for all practical purposes the era of self-sufficient, small family farms is ending. These small family farms find it increasingly difficult to earn a living from farming alone. Many are forced to subsidize their income with non-farming jobs.

Small, or limited resource, farms are often defined as those with less than $20,000 in farm sales annually. The USDA defines small farmers as those who operate farms by providing most of the labor and management; depend on farming for a significant portion, though not necessarily a majority, of their income; and have total family incomes from farm and non-farm sources below the median non-metropolitan family income in their states.

Extension Special Programs is designed to aid the small family farmer faced with the problem of survival. With the constant influx of technological information directed toward large farm operators, many small farm operators have not kept abreast with the radical changes in agriculture. Special Programs is bridging the gap between the small farmer with limited resources and the new agricultural technology.
Small Farms Activity
The basic problem for the small farmer is a lack of real income created by a lack of knowledge in basic farm management techniques, including farm planning and proper pest management, soil preparation and fertilization, livestock management and harvesting and marketing farm products. Extension programs emphasize providing technological assistance needed to improve efficiency, increasing incomes through efficient production and marketing systems, improving living standards through increased knowledge of the new agricultural technology, and increasing the use of available goods and services.

Substantial progress is being made in the areas of adaptive technology which converts recent advancements in mechanization to small power packages such as one row sub-soiling; field demonstration and tours designed especially for limited resource farmers; improved record keeping and management techniques; and cooperative efforts in purchasing, production and marketing.

Program planning and execution also include efforts in non-agricultural areas with projects and activities in food production and nutrition, consumer education, family planning, housing, community development and youth development.

DIVISION OF REGULATORY AND PUBLIC SERVICE PROGRAMS

L. H. Senn, Director

This division of Clemson University operates several consumer protection-type programs 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 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 1980-81.

Some of the major activities of the department for the July 1, 1980 - June 30, 1981, period follow:*  

<table>
<thead>
<tr>
<th>Activity Description</th>
<th>Number</th>
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<tbody>
<tr>
<td>Fertilizer usage data — tons</td>
<td>873,248</td>
</tr>
<tr>
<td>No. of fertilizer samples procured and analyzed</td>
<td>6,609</td>
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<tr>
<td>No. of fertilizer samples not meeting guarantee</td>
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<tr>
<td>Percent of fertilizer samples not meeting guarantee</td>
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<tr>
<td>No. of liming materials procured and analyzed</td>
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<tr>
<td>Total number of liming materials not meeting guarantee</td>
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<tr>
<td>Percent of liming materials deficient</td>
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<tr>
<td>Total number of individual deficiencies in liming material samples</td>
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<tr>
<td>Number of irregularities other than underweight</td>
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<tr>
<td>Weight irregularities</td>
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<tr>
<td>Fines collected, payable to state treasurer</td>
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<tr>
<td>Penalties collected, payable to state treasurer</td>
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<tr>
<td>(Deficiencies where consumers not identifiable)</td>
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<tr>
<td>Fertilizer registration fees collected, payable to state treasurer</td>
<td>$9,506.00</td>
</tr>
<tr>
<td>Lime registration fees collected, payable to state treasurer</td>
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<td>Lime permit fees collected, payable to state treasurer</td>
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<tr>
<td>Fertilizer taxes turned over to state treasurer</td>
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<tr>
<td>Total monies sent to state treasurer</td>
<td>$258,277.08*</td>
</tr>
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</table>

**Fertilizer Movement in 1980-81**

The extreme drought in 1980 and low rainfall in winter 1980-81 had an influence on the pattern of distribution and total fertilizer used in the

* This is a first report. Final report may vary slightly.
State. Fall pasture fertilization was curtailed due to drought conditions. In searching for additional income, farmers tripled wheat acreage. Wheat fertilization partly off-set the decrease in pasture fertilization. Therefore, fertilizer used July through December was 171,269 tons, down only three percent from the previous year.

Continued dry conditions during the winter allowed field operations over the entire period. Farmers pushing for high yields in 1981 to offset disaster in 1980 applied 80 percent more fertilizer in January, February and March 1981 than in 1980. However, fertilizer application in early spring of 1980 was unusually low because of wet fields. Fertilizer tonnage was down in April, May and June of 1981 since tonnage was extremely high during these months in 1980.

Total fertilizer used in 1980-81 was approximately 873,248 tons, a 7.0 percent increase over 1979-80. Even with continued fertilizer price increases, most farmers realize the yield response and profit potential of adequate fertilizer use.

Fertilizer and Lime Sampling

The department procured a record 6,609 samples during the year. Farmers realizing the advantage of being sure of the quality of fertilizer purchased requested more samples. Another reason for the sample number increase was the dry conditions which allowed field application during a much longer period of time than usual. This allowed the inspectors to cover their territories more adequately and sample the fertilizer as it was moving to farms. The large number of samples not only indicated to both farmers and fertilizer manufacturers the quality of fertilizer produced, but it also indicated a pattern of quality. This pattern allowed manufacturers to observe potential problems so they could be corrected. Many small manufacturers do not have laboratory facilities, and the chemical analyses of samples drawn by inspectors are the only ones seen.

The 339 agricultural liming material samples drawn were more than in any year since the S. C. Liming Materials Act was passed in 1976.

Improvement in Quality Control

Of the 6,609 official fertilizer samples drawn in 1980-81, 21.3 percent were deficient in one or more elements. Even though this is still much higher than desired, it is 2.6 percent lower than 23.9 percent in 1979-80 and 6.9 percent lower than the 28.2 percent in 1978-79. Computer printouts were sent to manufacturers during the season indicating where deficiencies were occurring. Trends were discussed with manufacturers to identify and correct problems. This approach of assistance to manufacturers is only one method of assuring farmers and other fertilizer users of quality products.
Only 2.7 percent of agricultural liming material samples did not meet minimum requirements. With the passing of the Agricultural Liming Materials Act in 1976, farmers now know the quality of lime being offered for sale.

**Soil Amendment Regulations**

Since the Soil Amendment Regulation was passed in 1979, no soil amendment registration requests have been approved. Registration applications by two companies have been reviewed. The claims made for the products of these companies did not classify them as "soil amendments"; therefore, it was determined that registration was not required.

Many questionable products which were sold in the State prior to 1979 are no longer offered for sale.

**Plant Pest Regulatory Service**

**The Crop Pest Act**

*Nursery Inspections:* A total of 662 nurseries, greenhouses and vegetable transplant growers and 813 nursery dealers were licensed to sell plant material, including 21 out-of-state dealers. Three hundred and ten additional establishments were visited on routine inspections to determine compliance with quarantines and regulations and to provide assistance with pest problems. The number of compliance checks was considerably lower than last year and is a direct result of personnel being involved with the imported fire ant aerial treatment program conducted during the fall of 1980.

The computer program for issuing nursery and nursery dealer licenses as well as compiling the nursery directory is operating nicely and has been more efficient for program operations.

*Sweet Potato Inspections:* Eight-five inspections, including storage, plant bed and field inspections, were conducted for 25 growers in the Pee Dee, Sandhills and Coastal Plains areas of the State. Regular and certified seed stock was involved. There were more early season plantings in 1981. The plantings were also spread over a longer period of time than usual due to the scarcity of plants and spotty rainfall. This resulted in more visits to some farms to complete the required inspections.

*Phony Peach:* Approximately 1.3 million peach trees were inspected in commercial orchards for the presence of phony peach disease. A total of 944 peach trees were found infected with this disease during the 1980 survey season as compared to 2,639 last year.

*Japanese Beetle:* One hundred fifty survey traps were placed in Chester, Fairfield, Kershaw, Laurens and Lancaster counties. As a result of trapping data, the counties of Chester, Fairfield and Laurens are considered infested. Extensions beyond the infested area were noted in Lancaster County, and a new infestation was found in Kershaw County.
Miscellaneous Inspections: Seventy-four “Phytosanitary Export Certificates,” 44 state and 30 federal, were issued for various agricultural planting seed and plant material, primarily orchids and chrysanthemum and rhododendron cuttings, destined to other states, Canada and foreign countries. Twenty-two foreign countries were involved. Twenty-two regular “Certificates of Plant Inspection” were issued for sweet potatoes, tobacco seedlings, tea plants, nectarine budwood and assorted houseplants being moved or shipped within the United States. Six states, primarily Florida, Georgia and California, were involved.

Inspection was conducted of incoming tomato transplants from Florida for seven growers in the coastal area. Tobacco plant bed inspections were performed for seven growers who had made applications for shipment to North Carolina.

Bee Disease Act

A total of 4,761 bee colonies were inspected. Fifty-nine were found infected with foulbrood and two with chalkbrood disease. Certification was issued for 2,214 colonies being moved to North Carolina, New York, New Jersey, Wisconsin, Virginia and Georgia.

Cooperative State — Federal Programs

Imported Fire Ant: A total of 20,450 acres were treated in Orangeburg and Bamberg counties. The main objective of the treatment was to evaluate the aerial application of Amdro, a new fire ant insecticide, as a control measure when applied to infested pasture land, hay fields and other non-agricultural lands. Monitoring sites established and evaluated approximately four and six months after treatment averaged 60 percent control. These results were lower than expected and were possibly related to the size of the treatment block and limitations on the areas that could be treated.

Gypsy Moth: Sixty-eight male moths were trapped in the State. Sixty-four were trapped in the Myrtle Beach area of Horry County. The remaining four were single catches in Georgetown, Florence, Charleston and Colleton counties. The find in Colleton County represents a new county record. 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. Nothing suspicious was found. Larval trapping was conducted earlier in the year, and traps were left in place throughout the season. No other life stages of the gypsy moth have been found to date in South Carolina.

Inspections of Christmas trees from northern states were conducted at 17 locations throughout the State for the presence of gypsy moth egg masses. Results were negative.

Witchweed: Sixty-three properties totaling 1,191 acres were released from quarantine. However, infestations encompassing 2,652 acres were
found on eight new farms. A total of 8,378 acres received one or more herbicide applications for witchweed control for an aggregate of 20,964 acres treated. From the beginning of the program, 343 farms and 5,167 acres have been released from quarantine.

**South Carolina Pesticide Control Act**

*Registration:* In 1981, 606 companies registered 6,087 pesticide products for sale in South Carolina, an increase of 9.0 and 6.0 percent, respectively, compared to 1980. The number of pesticide samples collected and analyzed was 2,530 with 70 (2.8 percent) found deficient in the guaranteed percentage of one or more ingredients. Compared to 1980, 520 more samples were collected, with the number of deficiencies decreasing by 0.2 percent. Stop sale notices were issued on all deficient products. Registration fees totaling $98,711 were deposited.

Utilizing provisions of the Federal Pesticide Control Act, the department issued 30 Section 24(c) special local need registrations. One Section 18 emergency exemption was issued for the use of Pydrin to control tomato fruitworm in coastal counties.

*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 1981 the following licenses were issued: 11,828 private applicators; 1,333 commercial applicators; 718 noncommercial applicators; and 521 pesticide dealers. Certification fees totaling $40,317 were deposited.

Each quarter, certification examinations were given throughout the State with at least three locations for each quarterly session. Department 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 1981: 1,950 pesticide dealers, 250 county agents, 400 commercial applicators, 128 aerial applicators, 210 non-commercial applicators, 60 private applicators, 45 manufacturers, 475 pest control operators, and 375 miscellaneous contacts.

A total of 385 structural pest inspections were conducted. The promulgation of comprehensive structural pest control regulations in August 1980 has increased the workload in this area but will result in safer pesticide use and more complete consumer protection. The majority of pest control companies are demonstrating a willingness to voluntarily correct deviations from the standards.

Twenty-nine investigations of potential pesticide misuse were conducted in 1981, with the two major problems being drift of pesticides onto non-target sites and coastal county fish-kills resulting from run-off from treated fields. No misuse of pesticides was involved in the fish-kills. The other major enforcement area involved pesticide dealers who were
not submitting required restricted use pesticide sales records or were selling to unlicensed individuals.

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. However, 11 pre-hearing conferences were held and 327 warning letters were issued (mostly related to record keeping violations). Several cases of criminal fraud were referred to the Attorney General’s Office for action.

**Department of Agricultural Chemical Services**

This department performs the chemical analyses reported by the Department of Fertilizer Inspection and Analysis and the Plant Pest Regulatory Service. Most samples analyzed were multi-components; therefore, instead of the numbers reported, more than 25,000 individual analyses were made. The laboratory has concentrated on improved methodology, instrumentation and organization to analyze all samples quickly and accurately.

**Department of Seed Certification**

Seed Certification is a program of standards imposed on seed and plant production that ensures varietal purity, good germination and freedom from noxious weed seeds. Participation in the program is voluntary.

Clemson University was designated by law in 1945 as the agency for inaugurating and carrying out a program of certification of pure seed and plants in South Carolina. The Seed Certification Department of Clemson University and other seed certification agencies in the United States must comply with standards for certification of seed in Federal Seed Act Regulations.

Departmental field work in 1980-81 involved inspections of 80,519 acres, the second largest acreage in the 35-year existence of the program in South Carolina. The work included inspections of 75 varieties of 13 crops for 284 farmer-growers and 29 seed-producing firms participating in the program. Each field was inspected to determine if the crop was true to variety and free of noxious weeds.

Major acreages of crops inspected in the program were soybeans, 49,959; small grains, 22,013; and cotton, 6,582. The acreages of soybeans and cotton certified decreased by 12,571 and 3,995 acres, respectively, but small grains acreage increased by 9,905. The acreage of cotton certified was the smallest since seed certification began in South Carolina in 1947. The 17,972 acres of wheat certified in 1981 established a record for certification of that crop, almost double the previous record acreage of wheat certified.
In addition to field inspection work, the department issued 1,354,311 tags for use on South Carolina certified seed.

In a continuing effort to monitor certified seed quality, 693 seed samples were drawn by the department during the year. Analyses of these samples were compared to the growers' samples of the same seed lots, and the samples were planted adjacent to each other in the field for observation.

To comply with new certified seed processing regulations, 34 facilities were inspected and approved in the spring of 1981 for custom processing of South Carolina certified seed in 1981-82. The Approved Certified Seed Processor classification will remain in effect for a year unless revoked because of a poor performance record in processing seed.

All crops for certified seed production were adversely affected by drought in 1980-81. The 1980 soybean crop was the most severely damaged with average yields in the range of no more than 10-12 bushels per acre.

The threat of a scarcity of good seed and high seed prices generated by the projected shortage prompted many growers to have oil beans cleaned to plant in 1981. What initially appeared to be a sure market for selling all soybean seed at high prices, developed into a limited demand for all except a few newer varieties. High seed prices set early in the season and a decline in oil bean prices were primary contributing factors.

After a summer and early fall in which all wheat available was sold for seed, a record wheat acreage was planted for seed production in 1981. Though soil moisture was much below normal during the winter, rainfall was adequate for small grains. Because of the reduced rainfall, spraying herbicides on grain fields for weed control in late winter was more easily accomplished with ground operated equipment than normal. However, lower than optimum temperatures reduced the effectiveness of herbicides in some fields. About 660 acres of small grains were rejected for certification because of excessive noxious weeds or other crop contamination in fields. In spite of some yield reduction caused by the drought, the small grain seed crop harvested in South Carolina in 1981 was generally better than anticipated.
LIVESTOCK-POULTRY HEALTH DIVISION

C. E. Boyd, Director

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 conducted on a national basis. It also provides 50 percent of the funds for administering the South Carolina Meat and Poultry Inspection Program.

The following report highlights the activities of this division during 1980-81.

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 impossible to differentiate clinically. During the year the laboratory handled more than 3,000 cases and conducted 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. South Carolina was declared a U. S. Pullorum-Typhoid Clean State in October 1980 by the U. S. Department of Agriculture.
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 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. From 94 to 108 auction markets are inspected each month, and this division furnishes a veterinarian and a livestock inspector at each sale to ensure compliance with all animal health requirements. In addition, a veterinarian is present at all dispersal and consignment sales for cattle and swine.