1978

Annual Report of the Clemson Board of Trustees, 1978-1979

Clemson University, Board of Trustees

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Annual Report 1978-79
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Walter T. Cox, *Vice President for Student Affairs and Dean of Students*

* Deceased. Term completed by Louis P. Batson Jr.
** Retired.
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PREFACE

Because of one man's dream of a better life for South Carolinians, Clemson University was established to respond to people's needs. Throughout its 85 years of service to the State and nation, Clemson has remained a "people oriented" institution. Its teaching, research and public service activities touch people's lives every day.

As a state land-grant institution, Clemson's earliest commitments were to the "study of agriculture and natural science," and later to the expansion of industrial growth. These early commitments continue, but they expand as mankind's needs change. Today, Clemson is responding to a wide range of problems affecting South Carolinians and people everywhere: developing new food sources and better food production and delivery systems; seeking a safer, better quality environment; improving health care delivery; creating innovative education programs; developing new industrial technology; broadening recreational and other opportunities for self-enrichment; and seeking to improve man's other basic needs, clothing and shelter.

Through these and other commitments, the University's nine colleges and Graduate School are exploring all fields of knowledge to improve the quality of life.

Clemson began this commitment to people when its doors opened in 1893. That day was the realization of a dream come true for Thomas Green Clemson, a man of wisdom and courage who saw the great need in South Carolina for a scientifically oriented institution of higher learning to provide the State's young people with the training needed to build a better society.

So strongly was he committed to the establishment of such an institution that he bequeathed his land and other real and personal property to the State for use in creating the "high seminary of learning" he envisioned.

Mr. Clemson was a scientist and agriculturalist who came to South Carolina from Pennsylvania in the 1830s and married a daughter of John C. Calhoun, foremost statesman in South Carolina history and vice president of the United States from 1825-32.

In 1889, the year following Mr. Clemson's death, the South Carolina General Assembly accepted the terms of his will, and, following the decision of the United States Supreme Court to uphold the will, the State of South Carolina and the full Board of Trustees proceeded to convert the dream of Thomas Green Clemson into the reality of Clemson Agricultural College.
The College also was established under the Morrill Land-Grant Act passed by Congress in 1862. Clemson, therefore, is a member of the national system of state universities and land-grant colleges.

In 1964, in recognition of expanded offerings of the institution, not only in the areas of agricultural and mechanical arts, but also in the sciences and arts, the name of the institution was changed to Clemson University.

The University now has nine colleges and the Graduate School. The colleges are Agricultural Sciences, Architecture, Education, Engineering, Forest and Recreation Resources, Industrial Management and Textile Science, Liberal Arts, Nursing and Sciences.

This report presents a comprehensive look at Clemson University, its programs and activities during the 1978-79 academic year.
ACADEMICS 1978-1979

Graduate Studies and University Research
Arnold E. Schwartz, Dean

Undergraduate Studies
* Claud B. Green, Dean

University Extension
Samuel M. Willis, Dean

College of Agricultural Sciences
Luther P. Anderson, Dean

College of Architecture
Harlan E. McClure, Dean

College of Education
Harold F. Landrith, Dean

College of Engineering
Lyle C. Wilcox, Dean

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

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

College of Liberal Arts
H. Morris Cox, Dean

College of Nursing
Geraldine Labecki, Dean

College of Sciences
Henry E. Vogel, Dean

* Deceased.
The mandate and stipulations clearly stated in the will of Thomas Green Clemson "to afford thorough instruction in agriculture and the natural sciences connected therewith" continue to define the mission of the instructional programs in agriculture at Clemson University. The emphasis on quality education in agriculture is further augmented by the service-oriented philosophies of land-grant institutions and by the fact that Clemson is the only institution in the State at which the bachelor's or higher level degree is offered in agriculture.

Agriculture is a dynamic field of critical importance to human welfare. The traditional role of agriculture has been to provide food, feed, and fiber to humankind and for domestic animals. This has become a greater challenge in light of increasing population and decreasing land area for production. It is further complicated by governmental restraints and regulations. Of course, the producer is a business man; profit is a necessary consideration in meeting the traditional challenge. In recent years the role of agriculture has expanded more into business and management, and now more than ever includes conservation issues and increasing emphasis on mechanization. All programs, including instructional programs, must continuously grow and evolve; otherwise, the fundamental mission of instruction in agriculture cannot be met.

To meet Clemson's mission:
- Instruction is principles-based and problem-solving-oriented. Recognition and solution of practical problems are stressed, but programs are not vocational because of the foundation of principles on which problem solving is based.
- Instructional programs are continuously reviewed and revised, including content of existing courses, development of new courses, and full curricula review and revision to ensure the best total education.
- In keeping with the total educational mission and in response to the maturation of Clemson to a broadly recognized and respected university, the growth and development of graduate programs at the master's and doctoral level continue to be encouraged.
- Special programs are developed and administered to help meet the educational needs of all classes of agriculturalists in the many diverse forms of agriculture throughout the State.
Major undergraduate curriculum revisions have been implemented, and review and revision have become a continuing process. All formal undergraduate minors were reviewed, and proposals for at least two new undergraduate curricula are being prepared—integrated pest management and a public service or extension methods option. The modifications of the preveterinary medicine program have been highly successful and well accepted.

First semester enrollment for the college was nearly 1,100. In keeping with current trends, almost 40 percent of the undergraduates are women, and more than 50 percent of the students come from “nonfarm” backgrounds. This situation demands that continuing efforts be made to clearly illustrate the relationships between principles taught in the classroom and laboratories and practices as they exist under actual conditions. To better serve the increasing number of nonfarm students, development of formal internship or practical courses and greater cooperation with the Cooperative Education program are being emphasized.

Growth in enrollment of new freshmen slowed and may have reached a temporary plateau. Transfer students at the sophomore and junior levels continue to represent a significant portion of the student body in all curricula and reflect a continuing, mature awareness of the importance of professional training in agriculture. Career opportunities and demands for graduates remain high. Efforts to inform high school counselors and prospective students must be expanded so qualified graduates will be available to fill these positions.

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

A total of 253 students graduated in agriculture this year. This number includes 185 Bachelor of Science and 30 Master of Science degrees, 21 professional degrees (Master of Agriculture and Master of Nutritional Science), and 17 Ph.D.’s.

Agricultural Technology Programs

The College of Agricultural Science continues to cooperate with the State Board for Technical and Comprehensive Education and the State Department of Education in guiding the agricultural tech-
nology programs offered at selected technical colleges in the State. In addition to the advisory role played in curriculum development, the college cooperates by sharing facilities for study and/or demonstration at Clemson as well as at several research stations.

Currently, 12 two-year programs and a single one-year certificate program are offered at eight technical colleges throughout the State. Enrollments in these have increased from 371 in 1974-75 to over 550 in 1978-79. Job opportunities and salaries for graduates have been good, and prospects remain favorable. The cooperative arrangement, which was initiated in 1966-67, has helped develop sound programs without apparent duplication among units or with programs at Clemson and will help ensure continued success of these technological programs. The State Advisory Committee, chaired by the dean of the College of Agricultural Sciences, recommended approval of a Swine Science Technology Program, ultimately to become an associate degree program and a diploma program in horticulture. It also recommended a survey to determine the educational/service needs for teaching in equine science. Faculty of the college will guide this survey.

Efforts continue to strengthen the agricultural transfer program at South Carolina State College at Orangeburg. Relatively few students have chosen the pre-agricultural program at South Carolina State and subsequently transferred to Clemson to complete the degree requirements. However, personal contacts with faculty and prospective transfer students have been made and continued; slow growth is anticipated.

**Continuing Education**

To help them keep pace with the rapid changes affecting agriculture, varied formats are needed to serve scientists-teachers, producers and agribusiness professionals in all fields of agriculture. There is a continuing high level of interest in various types of in-service training programs, as well as conferences, workshops, seminars and professional meetings. Continuing education activities sponsored by the College of Agricultural Sciences served personnel in the Cooperative Extension Service, hortitherapy technicians, vocational agriculture teachers and veterinarians. Continuing education credit was granted for numerous programs, and more than 150 individuals received Continuing Education Units for one or more programs.

There has been continuing demand to offer regular courses in agriculture for graduate credit off campus with major interest com-
ing from the Pee Dee District. Since this type of activity must be self-supporting, other sources of support are being explored.

The success of the educational efforts of the College of Agricultural Sciences and its students can be measured in a number of ways. Career placement of graduates is excellent, and new employers continue to seek opportunities to interview our students. Our students serve important roles in extracurricular activities (president of the Clemson Student Body), and their scholarship accomplishments are reflected in the recognition of outstanding students by professional organizations and by continued growth in scholarship support. A newly endowed scholarship was established in 1978-79 ($25,000 by A. Harvey and Mary Snell, alumni). The college notes with great pride that Dr. T. E. Skelton received the University’s Alumni Master Teacher Award in 1978, and subsequently has been invited to present a paper on education in entomology at an international meeting. Similar honors and recognition have been bestowed on other faculty.

COLLEGE OF ARCHITECTURE

In recent years there has been a growing interest and concern regarding the quality of life of all our citizens. These concerns relate directly to the professional studies, research and public service activities of the College of Architecture. The college educates young people for professional practice in those several interrelated fields that directly form man’s built environment. Creative effort in planning and design establishes the framework for the quality of life of all citizens of South Carolina. Each of these component professional areas is involved with problems of the physical environment at a different scale. These scales range from urban and regional planning at the macro level to urban design, neighborhood planning and architectural design at the intermediate scale to product design and building interior design as well as furniture and equipment design at micro-scale.

To better prepare students for these professions, which have certain common fundamentals but divergent specialized complexities, a common matrix of studies has been revised and refined in 1978-79. The matrix includes the first two years of design and building science undergraduate study and this is followed by a second couplet of studies with more specific design and adjunct course concentrations. To place students in the concentration for which each is best suited, careful student measurement and individual coun-
counseling was needed and has been refined. Records have been developed for recording student progress noting relative motivations. Because of the national reputation of the college, pressures for initial admission exceed that of other units of the University and it is important that responsible and effective selection occurs before admission to each of the three successive couplets in the school's six-year professional programs. The final two years in each is, of course, in the graduate school. The extensive work of student interviews, measurement and counseling is carried on by carefully organized faculty committees of the college.

To properly understand the development of the College of Architecture during the past year is to see it clearly as a professional college, educating students for “practice” as differentiated from education in areas which find their graduates involved in a wide range of post-collegiate activities. It is a truly professional college.

During the past 20 years students of the College of Architecture at advanced and graduate levels have been involved in public service and research as the instruments of instruction in real world environmental design problem-solving. It is of central importance that architects, planners, landscape architects, building scientists and product designers utilize the resources of the entire world in developing awareness, background and capability.

Some professional design organizations in South Carolina have been involved since World War II in professional practice in many areas of the world and have not been limited to practice in this state, region or country alone although they are physically based in this state. To make the most effective use of foreign resources for advanced professional study and to familiarize students with professional practice and environmental problems in Europe, as well as to facilitate a more personal understanding of the cultural history of the Western World, the College of Architecture, through the sponsorship of the Clemson Architectural Foundation, established the Charles E. Daniel Center for Building Research and Urban Study in Genoa, Italy, in the fall of 1973. All expenditures for the physical development of this center have come from private subscriptions, and no state funds have been utilized.

By the end of the academic year 1978-79, 220 graduate students had been in residence at the center for at least a semester. Moreover, two major continuing education short courses for South Carolina professionals have been offered there. Eleven members of the faculty of the College of Architecture have served as profes-
sors-in-residence for a period of one year, and 28 faculty members from European universities have volunteered their services for lectures, seminars and juries without remuneration. Following the college’s model of utilization of research and public service as vehicles for study, the center has welded warm international relations by undertaking planning, architectural and building science projects in Genoa. Some of these have been published in documents here and abroad. The summer ’79 issue of Clemson World described one such project, and a number of others have been documented in recent issues of The Semester Review, the organ of the College of Architecture, and in publications of Italia Nostra, the Italian equivalent of the National Trust for Historic Preservation.

During 1978-79 the Department of Planning Studies has been collaborating with other departments of the college as in other years in comprehensive master planning studies for many of the State’s smaller towns. The development of the South Carolina “Great Towns Program” gives new impetus to these critical public service ventures and places a new emphasis on plan implementation.

The department participated Sept. 11, 1979, in a one-day workshop, sponsored by the State Development Board, on “Comprehensive Town Appearance.” Later in the coming year the College of Architecture will offer a two-day continuing education workshop to address improvements in planning method and problems and opportunities in other areas of the planning field. The conference will include lectures by noted American planning consultants who are working in developing countries.

During 1978-79, three one-day conferences were sponsored by the college. One on the subject of coastal zone management stimulated two faculty members to seek and receive a major research grant from the S. C. Coastal Council.

During the year ahead a short course sponsored in collaboration with the S. C. State Personnel Division will be prepared for appointed officials and focus on their role in state and local planning.

During 1978-79 particular efforts were made within the college to effect collaboration between Health Care Facilities Planning Studio of the Department of Architectural Studies and the Department of Planning Studies personnel with special expertise in health facilities planning on a broader regional scale. Proposals are being developed to offer expanded public service in this critical area. Past Health Care Studio accomplishments are impressive.
For the past 25 years the architects of South Carolina, a great percentage of whom are graduates of Clemson, have been strong supporters of the college's programs in a manner not equalled in many places. The college has made a steadfast effort to reciprocate by continuously rendering services to that profession.

In addition to offering continuing education study tours at the Overseas Center in the last two successive years, a domestic design study tour to Columbus, Indiana, was conducted July 26-30. A short course on Solar Energy and Building Design was offered Aug. 28-29 in collaboration with the Clemson Housing Institute. On a broader scale, Professor Ralph Knowland, chairman of the College of Architecture Committee on Continuing Professional Education, serves as a member of the National AIA Continuing Education Committee.

As a means of stimulating mutual interaction between the college and the public, a volunteer S. C. Practitioners Lecture and Critics Program has been reintroduced. During 1978-79 lectures were given in the Professional Practice Class by 18 different practitioners, and in the design area many state architects in rotation served without cost in classroom lectures, design juries and in routine studio critic capacities. As each student in the college is required to acquire 1,000 hours of approved professional office experience as a degree requirement, the visiting practitioner program places the student in contact with potential employers and stimulates the practitioner with the creative academic environment.

In addition to normal instructional responsibilities which the Department of History and Visual Arts rendered in 1978-79 to all students of the college and many in other areas of the University, its faculty has been active in personal creative work, publications and important public service.

The physical expansion of South Carolina requires an ever increasing sensitivity to preservation and conservation of our historic buildings, spaces and monuments. An unfortunate number of these have been needlessly destroyed in years past. The architectural historians on the faculty have actively participated as consultants and a preservation resource to a wide variety of interest groups involved in saving and improving our heritage.

The urbanization of the State has resulted in the need for greater richness in our built environment. Our faculty has played a key role in stimulating an interest in and then creating art in public spaces. Faculty have thus participated by delivering lectures, cre-
ating significant art work and collaborating with the State of South Carolina Arts Commission in these developments. The Department of History and Visual Arts enjoys a very close relationship with the Arts Commission as faculty members are continually asked to serve on committees and act as consultants to the Commission.

The graduate program in the Visual Arts has produced a significant number of graduates who remain in the State, serving as professors, artists, museum personnel and as resources for a richer growth.

For several years the college has been steadfastly seeking to build a strong relationship between architectural design and building science as an important resource for that creative effort. During 1978-79 great progress was made in this area for the mutual advantage of both groups. Faculty members in structural design, mechanical plant and acoustics have served as consulting critics in architectural design studio on a scheduled basis. This was first started with students in the matrix, and thus work habits and study norms established for professional life.

There continues to be a growing demand for Clemson graduates in building science. A recent survey conducted of outcomes of students in this discipline that graduated in 1974, indicated their average 1979 salary to be $38,400. Some sixty-four percent of all construction management students are native South Carolinians, and the majority of these remain in the State or region, although there is enormous demand for them in other parts of the country.

The Department of Building Science, like the Department of Architectural Studies and the Department of Planning Studies, has offered continuing education short courses. One such course co-sponsored by the Carolinas Branch of AGC on "Construction and Contract Law" was recently offered. A series of on-going "Supervisory Training Programs" were scheduled for fall 1979 for middle management personnel.

During 1978-79 there was literally a growing stream of requests for expansion of college utilization of research and public service as the instruments of upper and graduate level instruction. Every effort has been made to grow consistent with resources available, and in accordance with college policy to undertake work that relates to other college accomplishments, as a means of improving the state of the art.
During 1978-79, the College of Education placed major emphasis upon evaluation and improvement of programs and services.

National Accreditation

All curricula offered by the College of Education were fully accredited by NCATE (The National Council for Accreditation of Teacher Education) in 1979. Clemson joins more than 550 colleges and universities whose programs are accredited by this national agency. The College of Education was visited in February 1979 by an evaluation committee and notified in June 1979 that all undergraduate and graduate programs in teacher education had received full accreditation.

Previously all programs in the College of Education received full approval by the State Department of Education which uses the NASDTEC (National Association of State Directors of Teacher Education and Certification) standards.

A number of significant curriculum and program changes were initiated during the past year. These changes have moved the college toward a more laboratory-centered curriculum in all programs. A total of over 700 public school practicum placements were made this past year, and approximately 300 school children were brought on campus as part of the practicum endeavors. The new 36-hour Master of Education degree program was also implemented.

Enrollment

The College of Education continued to attract large numbers of students, especially on the graduate level. Graduate enrollment consisted primarily of teachers and administrators enrolled on a part-time basis.

The college conducted 110 off-campus courses at 42 locations in the State with 2,491 students enrolled. Cooperating private colleges—Columbia, Erskine, Newberry, Presbyterian and Wofford—taught 13 courses for 99 teachers who received graduate credit at Clemson.

Employment of Graduates

The high percentage of College of Education graduates who make appropriate NTE scores for certification has caused public school recruitment—in state and out of state—to increase. The
College of Education is unable to meet the demands for graduates in vocational education (agricultural education, industrial arts, vocational education), mathematics, science and special education.

**In-Service**

The college has been heavily involved in public school in-service activity. The demand for various in-service items is heavy and seems to be increasing. A major problem, however, is that the regular teaching loads plus the overload teaching of our faculty limits the amount of in-service activity in which the faculty can participate. The Clemson Reading Conference was well attended as was the Greenwood Innovations Day program. The education honor groups were quite active with Phi Delta Kappa leading the way with a fine series of meetings and programs.

The Department of Agricultural Education conducted small engine workshops at strategic locations across the State with a total of 81 teachers participating. In addition, 50 teachers participated in power equipment workshops at off-campus locations.

A large, enclosed trailer containing equipment and supplies for conducting workshops to upgrade the knowledge and skill levels of teachers of vocational agriculture has been designed by the Agricultural Education Department. This unit can be readily moved around the State as needed. Complete learning modules are available for sessions in selected areas of agricultural mechanics, ornamental horticulture and animal science. Other modules are to be added later as funds become available.

An innovative course, "Modern Topics and Issues," was taught in Greenville and Florence by the Agricultural Education Department. Course content was structured around organizing and utilizing advisory committees. As a direct result of this course, program advisory committees were organized and began functioning for 13 agricultural programs in 11 high schools and area vocational centers.

The Department of Agricultural Education continues to assist agriculture departments in program evaluation through a Standardized Achievement Testing program designed to measure the cognitive domain of students enrolled in off-farm occupation courses.

The Department of Industrial Education was engaged in several important projects during 1978-1979. Among the most significant were the Appalachian In-service Institute for Trade and Industrial Education Teachers, the Special Institute for Vocational Teacher Educators, and the Graphic Communications Curriculum Project.
The Appalachian In-service Institute completed a professional needs assessment for 140 trade and industry education teachers, prescribed a program for each teacher to meet the identified needs, and provided the individualized instruction needed by each teacher. The institute was highly successful in meeting its stated objectives as reported in an evaluation study by Joe Nerden of North Carolina State University. The curriculum materials utilized by the institute will be available to other vocational teachers through the Department of Industrial Education.

Course offerings for vocational teachers were expanded through the Special Institute for Vocational Teacher Educators. The qualified applicants accepted for this institute received instruction in several critical subject areas in teacher education. Among the most important topics were individualized instructional materials, elimination of sex bias and sex-role stereotyping in vocational education, teaching handicapped and disadvantaged students, and policies and procedures for off-campus instruction. Instructors for the off-campus courses are selected from the participants of this institute.

A grant from the Printing Industries of the Carolinas Association (PICA) supported the continued revision, research and development of individualized curriculum materials for graphic communications. A new comprehensive curriculum guide was developed in screen-printing practices. Also, a self-instructional packet was developed for use by schools and industry in costs-estimating in printing. The PICA curriculum materials are in use throughout the nation as well as in several foreign countries.

The Vocational Education Media Center received two grants, one for the final phase of the Prevocational Instructional Materials Development and Kit Loan program, and the other titled "Developing a Statewide Implementation Capability for the Effective Utilization of Vocational-Technical Education Consortium of States (V-TECS) Catalogs of Performance Objectives."

Workshops were conducted around the State to orient prevocational teachers to the instructional materials and kit loan phases of the prevocational projects. Two-hundred-forty-one teachers and administrators attended. Complete sets of prevocational instructional materials were prepared and distributed to all prevocational programs in the State. The kit loan service was used by 36 teachers in the Appalachian Region during the school year.

In the second grant, 45 teachers were trained, using nine modules developed for statewide implementation of V-TECS catalogs during
a three-week workshop. These teachers then worked with teachers in their local schools to effectively utilize V-TECS catalogs.

The departments of Aerospace Studies and Military Science sponsored the Seventh Annual Tiger Drill Meet in March 1979. The event provided the opportunity for Junior ROTC drill teams of all services from high schools throughout South Carolina to compete for recognition. The meet also provides recognition for Clemson University among high school students and at the national level. For example, a brief story and photo concerning the Air Force winner of the drill meet was published in the monthly *Air Force Magazine*.

The Military Science Department sponsored the United States War College Current Affairs Panel discussions at the University. The six officers who constituted the panel taught classes and conducted discussions which were well attended by Clemson students.

The Department of Aerospace Studies nominated President Robert C. Edwards for the Tasker H. Bliss Medal sponsored by the Society of American Military Engineers. President Edwards was selected from among many notable nominations to receive the award, and it was presented to him by Brig. Gen. Clifton D. Wright. The Commander of the Air University, Lt. Gen. Raymond B. Furlong, visited the campus and paid tribute to President Edwards during a ceremony sponsored by the departments of Aerospace Studies and Military Science.

**Leadership Activities**

Faculty members in the College of Education were involved in local, state and national educational activities. They served as committee members on accreditation visits conducted by the Southern Association of Schools and Colleges and NASDTEC, on panels and consultant groups to state legislative committees and other educational groups, and on the Southern Association Commission on the Elementary School, the Southern Association Commission on the Secondary School, and the National Commission to Study Accreditation Issues in Teacher Education.
COLLEGE OF ENGINEERING

Clemson's College of Engineering contributes significantly to the continuum of technological change in its search for new knowledge. Simultaneously, it develops technological systems for the State and nation to assure that existing concepts are used to further economic and personal advantage for each of the citizens served.

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

The college strives to meet this challenge by working:

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

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

Instruction

The college offers eight undergraduate degree programs, 10 master's level and nine doctoral level programs. Six basic and four advanced level engineering programs plus our engineering technology program are accredited by the Engineer's Council for Professional Development.

More than 200 engineering undergraduates represent about 85 percent of all students participating in Clemson's Cooperative Education program, which allows students to alternate during their sophomore and junior years between school and full-time work in industry, business and agencies.

A dual-degree program allows students to earn basic baccalaureate degrees from Wofford, Lander, Newberry or Presbyterian colleges, followed by a B.S. degree in engineering from Clemson. Clemson is also cooperating with The Citadel in encouraging their pre-engineering program.

More than 2,000 undergraduates enrolled in engineering for the 1978 fall semester, an all-time high. Projected new freshman and
transfer student enrollment should boost that number by several percent for fall 1979.

The demand for engineers, particularly at the baccalaureate level, continues to grow. This has created strong competition among companies for graduates and has pushed salaries to record highs. The average 1979 Clemson engineering graduate had more than three job offers to choose from and began his career earning almost $18,000. Demand for women and minority engineers continues to be extremely strong. To meet these challenges, the college has set a goal of increasing undergraduate enrollment by five percent a year for the next 10 years.

There were 184 students enrolled in master's level programs in engineering, while 44 are pursuing doctoral degrees. More than 30 students have taken advantage of the college's external Master of Engineering degree program for the fall 1978, allowing them to pursue a professional graduate degree at home while working full time. Seven students have completed requirements for master's degrees in electrical engineering and two in mechanical engineering through the externally delivered mechanism since its inception in 1975-76.

The college has as a principal near-term goal to strengthen these graduate programs and accompanying research, with the intent of expanding the enrollment to 400 graduate students by 1983-84.

**Research**

College of Engineering research expenditures for 1978-79 exceeded $1.9 million, a record high, on 80 active projects sponsored by federal, state and industrial grants and contracts. Total research grants-in-force, including multi-year contracts, exceed the $5.3 million mark. Grants and contracts awarded to college faculty in 1978-79 exceeded $1.6 million, also a record for a single year. Eighty faculty were actively engaged in research during 1978-79. Their efforts were supported by more than 100 graduate and 40 undergraduate students.

Engineering research at Clemson has three essential objectives: (1) to seek new knowledge, (2) to seek answers to both short-term and long-term technical problems of the State and nation, and (3) to support advanced-level educational programs by providing basic and applied research projects for graduate and undergraduate students to gain engineering experience under the supervision of experienced engineering researchers.
More than $1 million in energy research projects make up the largest single area of research interest in the College of Engineering. Clemson engineers are helping the State and the nation move closer to energy independence by seeking cost-effective energy alternatives and applying sound engineering design principles to energy conservation.

A partial list of projects active during 1978-79 gives an indication of the breadth and scope of research in engineering at Clemson:

- An Energy Conservation Handbook for the textile industry was completed as part of a $445,000 interdisciplinary engineering effort sponsored by the U. S. Department of Energy in cooperation with the S. C. Energy Management Office.
- Improved cardiovascular materials and devices are the goals of three new bioengineering projects. Sponsored by the National Institutes of Health, these projects are valued at nearly $250,000.
- Improving the capability, during early system design phases, for prediction and planning of manpower, training and logistics support requirements associated with weapon system operation is the aim of a $183,000 study funded by the Air Force. Systems engineers at Clemson are teamed with engineers from Lockheed Georgia Company to conduct this study.
- Improved chemical contractors are being developed by electrical engineers to enhance materials management associated with the accountability of nuclear materials in nuclear fuel reprocessing plants, including the theft and loss of nuclear materials. This $99,900 project is funded by the Los Alamos Scientific Laboratory.
- A strategy and vehicle to help contain the rising cost of health care is the mission of the development by industrial engineering technologists of a specialized training program. A $35,000 grant under Title I, Higher Education Act of 1965, will help develop slide/tape and video tape in-service educational units on management engineering and problem-solving for the hospital manager.
- Civil engineers are seeking to develop improved masonry anchoring devices by investigating their cyclic response behavior in a 30-month, $130,000 project sponsored by the National Science Foundation.

Several college faculty received special recognition during 1978-79 for their accomplishments. Civil engineer Subhash C. Anand won the third annual McQueen Quattlebaum Faculty Achievement
Award for contributions to the fields of structural engineering, structural mechanics, biomechanics and finite element methods. Mechanical engineer Tah Teh Yang was invited to lecture on his research to several industries and the Japanese Society of Turbo-machinery. And in Germany, mechanical engineer Harry Law conducted an intensive short course on rail vehicle dynamics.

Public Service

Public service projects involved about 15 percent of the college’s total available faculty time during the 1978-79 academic year. The college is using its unique expertise to meet many of South Carolina’s problems in such diverse areas as energy alternatives and conservation, communications, transportation, computer utilization, health care delivery and others. The college’s role in technology support to South Carolina is required in the same way that the agricultural Cooperative Extension Service is needed.

Because individual faculty have broad knowledge and experience in a dozen or more technical fields, the faculty of the College of Engineering represents a resource of considerable magnitude to the State. Faculty willingly share this expertise by serving, at no additional pay, on regulatory and advisory boards and as expert advisers to agencies such as the State Development Board, Highway Commission, Nuclear Advisory Council, Department of Health and Environmental Control plus the governor’s office.

Another major area of public service by faculty members is the college’s Continuing Engineering Education (CEE) program. Technology transfer to practicing engineers and, through them, to their business or government employer has had an immediate and beneficial impact on the economy of the State. During the past year engineering faculty served more than 7,500 people through CEE courses, seminars, workshops and symposia which represented a total commitment of 562 program-days, making the Clemson program one of the strongest in the Southeast.

A major element of the CEE program was the 11th International Biomaterials Symposium held at Clemson in April 1979. It was attended by more than 400 clinical and research scientists from 31 states and 14 foreign countries to whom 135 technical papers were presented.

Another major CEE program involved the presentation of intensive three-week courses on microcomputers for the Western Electric Corporation. Ten of these courses will have been presented by the
end of 1979. Their excellence has been reaffirmed by each new group of participants who come from all parts of the country. This program has helped develop outstanding microcomputer laboratory facilities used by Western Electric engineers and also available to our regular students.

The first Clemson Conference and Exhibit on Small Computers, sponsored by the College of Engineering, was attended by more than 600 people. David Ahl, publisher of the most widely distributed small computer journal, gave the keynote speech. The conference featured 32 presentations concerning small computer applications in a variety of fields including engineering, agriculture, education, medicine and business. More than 30 exhibitors filled the main floor of the Clemson House with the latest in small computer systems, hardware and software.

Two significant new service activities were added last year. The first Summer Engineering Program for Minority Students was initiated with financing provided by more than 25 business and industrial supporters. The program brought 60 youths to the campus who had completed the sophomore year in high school in the summer of 1978 for a two-week introduction to careers in engineering. Forty-five of these students returned in the summer of 1979 for four weeks of more advanced project work in the engineering discipline of their choice. At the same time a new group of 60 selected students will experience the first year sessions.

The second new service activity was a workshop in engineering for women, a two-week program open to all South Carolina Appalachian Region female students who were rising juniors in high school. During the session 25 students, chosen from 77 applicants, stayed on campus and experienced a mini-version of college life. Classes were held in basic math and physics as applied to engineering problems, communications skills and lab work. The lab sessions stressed use of instrumentation with an engineering project culminating each students’ experience. Organized evening activities were also held, including cookouts and a pool party. This program was sponsored by the Appalachian Council of Governments and is scheduled to run for an additional two years.
COLLEGE OF FOREST AND RECREATION RESOURCES

In spite of a change in leadership within the College of Forest and Recreation Resources there has been no loss of momentum, and positive accomplishments continue to be made in teaching, research and extension. Davis McGregor, Ph.D., dean of the College since 1970, returned to teaching and research in the Department of Forestry and was succeeded as dean by Benton H. Box, Ph.D.

Department of Forestry

Notable among the accomplishments of the past year was the fact that 95 percent of the year's forestry graduates are working in their chosen field or continuing their education. The other five percent are employed in nonforestry fields. These figures exclude the 18 percent who have not kept us informed of their activities.

Service has been outstanding with many of the faculty serving on various state committees. Of national importance has been D. H. Van Lear's, Ph.D., chairing of the Society of American Foresters task force on appropriate silviculture systems for major forest types. R. M. Allen is chairman of the Southern Region of Association of State College and University Forestry Research Organizations, is on its national executive committee, was elected to the National Cooperative Forestry Research Advisory Board, and serves on the advisory board of the Southern Journal of Applied Forestry. D. D. Hook, Ph.D., is a member of the technical review panel for the Expanded Southern Pine Beetle Program.

Publication of the book Plant Life in Anaerobic Environments, which was edited by Hook, provides a substantial contribution to the knowledge of how plants live and function in wetland environments.

Teaching

During the academic year 1978-79, 51 candidates received their Bachelor of Science degrees. Forty-five were graduated from the Forest Management program and six from Wood Utilization. Eleven degrees were awarded at the graduate level, with seven candidates receiving the Master of Forestry degree and four receiving the Master of Science.

An in-depth review of the undergraduate and graduate forestry programs was completed by the faculty at a two-day departmental
teaching retreat in March. Recommendations for change are now with the department head.

Courses in forest entomology and forest pathology are now in the Department of Forestry curriculum as For. 301 and For. 407/607. R. L. Hedden, Ph.D., a forest entomologist, and F. H. Tainter, Ph.D., a forest pathologist, have been employed on joint teaching-research appointments and will be responsible for instruction in these areas.

W. D. McGregor, Ph.D., has added substantial expertise in the area of forest influences as a returning member of the department’s faculty. His new elective course, For. 405/605 (Forest Influences), will be offered for the first time in fall semester 1979 with good undergraduate/graduate enrollment anticipated.

Two new graduate courses were approved and taught. These courses, For. 805 (Advanced Silviculture I—Forest Soils) and For. 806 (Advanced Silviculture II—Tree Growth), are builders on basic silviculture and not necessarily sequential.

For. 312 (Reproduction of Forest Trees) is a new undergraduate elective and will be first offered in fall semester 1979.

The number of students in wood utilization reached 28 in the fall of 1978, the largest enrollment in the five-year history of the program.

Brochures describing the college’s forest management and wood utilization teaching programs were prepared and mailed to South Carolina high schools. A slide-tape program for presentation to high school students was also developed and is currently in final editing stages.

Funding was acquired for two wood utilization students to attend the national meeting of the Forest Products Research Society in Denver, Colorado.

The chaired position, the Robert Adger Bowen Professorship, was filled by M. A. Taras, Ph.D.

Research

During the past year the timber production team achieved or directly contributed to the development of a number of significant research accomplishments.

Results of a weed control and phytotoxicity study contributed to the successful EPA registration of a herbicide for controlling weeds in Christmas tree plantations, a continual problem for South Carolina tree growers. A cooperative effort with the South Carolina State Commission of Forestry resulted in the State’s first Virginia Pine Christmas tree seed orchard.
A study of the application of liquid municipal sewage effluent to forest sites showed this method of waste disposal to be environmentally safe and economically feasible for cities of the Piedmont. Research on the effects of chemical treatment of pines to increase naval stores production showed that growth losses resulting from the treatment demand efficient recovery of additional naval stores to maximize income.

Experiments on the regeneration of bottomland hardwoods indicated that clearcutting is a viable option, but that weather and site type may interact to affect results. A study of prescribed burning indicates that it may enhance the natural regeneration of the valuable upland species of yellow poplar. An assessment of root rot infection on slash pines in the Sand Hills showed the disease to be prevalent but controllable by appropriate practices.

In addition to the foregoing research results, there were a number of important research projects initiated during the past year. A cooperative study to evaluate methods of increasing survival and extending the planting season of pines was initiated with the State Commission of Forestry because of recent poor planting results in South Carolina. A study of alternative methods of regenerating valuable bottomland hardwoods was begun in cooperation with a prominent consulting forestry firm. In addition, a cooperative project with Oak Ridge National Laboratory was initiated jointly with the Zoology Department to study the effects of intensive harvesting on the forest ecosystem, a major concern as the demand for wood increases.

Another major research vehicle is the forest management research team, whose mission is to enhance the quality of life and economic strength of South Carolina by finding solutions to forest-based, multiple-use problems through a program of team-oriented research.

During the past year the team engaged in research projects examining alternate methods of processing forest management field data, analyzing the Conservation Reserve Portion of the Soil Bank Program, testing and modifying current forest management practices, comparing satellite imagery to conventional aerial photography, developing methods for locating forest recreation sites, investigating endangered and threatened forest flora, and examining the use of mulch as a remedial treatment for soil compaction around trees in urban areas.

The team's research accomplishments include the determination that more than 70 percent of participants in the Soil Bank Program
still have their conservation reserve in trees and that current satellite imagery technology can be utilized in delineating forest resource data.

Results from wood utilization research were the bases for two papers presented at national meetings, two papers published in wood products journals, and one technical note describing southern pine bark properties, supply and potential uses.

A study evaluating the effects of presteaming oak prior to kiln drying was initiated. Reductions in drying times and energy consumed are possible benefits of presteaming treatments.

A new fibrous mulch product was developed and installed in a Christmas tree plantation. If mulch performance is successful and economically feasible, the effort and time required in maintenance of Christmas tree plantations could be reduced as could the chemical control of vegetation.

The Belle W. Baruch Forest Science Institute faculty published eight articles and had four more manuscripts accepted for publication in various journals during the year. The director was senior editor of a book published by Ann Arbor Science Publishers, and the faculty and staff maintained 20 active research projects. Five new projects were also initiated during the year, three of which were cooperative efforts, one each with private industry, Francis Marion College and the U. S. Forest Service.

G. W. Wood, Ph.D., served as consultant to the Southeastern Cooperative Wildlife Disease Laboratory in the College of Veterinary Medicine, University of Georgia conducting a project in Puerto Rico and the Virgin Islands to inspect feral hog populations for African swine fever.

In an effort to broaden the scope of its research, the Baruch Institute hosted U. S. Forest Service personnel in South Carolina, the South Carolina Society of Consulting Foresters, and International Paper Company’s Research Council on separate occasions on Hobcaw. Research was discussed and areas of mutual interests and needs were identified.

During the year over 1,600 visitors were given guided tours by the education and information assistant, and several tours were given to professional groups by the faculty and staff.

Three environmental workshops were sponsored with Baruch funds by three different educational institutions throughout the State.

The faculty was active in giving seminars, workshops and attending meetings or symposia. Several were elected or served in various
capacities in professional societies and other organizations. Also the faculty participated in a lecture series at the Kimbel Center and in monthly radio spot releases on a local station.

The boardwalk in Reserve Swamp was extended across the swamp, a distance of about one mile, by the YACC and the Institute's maintenance crews. The boardwalk permits lay persons to experience and observe an environment which they do not normally encounter. It also allows scientists access to the area for teaching or research purposes.

**Extension**

Forestry Extension activities during the past year have concentrated on timber marketing, the economics of forestry as an investment, short courses for professionals, and the initiation of competitive events for young people.

The infrequency of sales of forest products by landowners continues to provide new audiences for timber-marketing information. During the past year marketing workshops were held for landowners throughout the Pee Dee region and in other scattered locations. Efforts are also under way to improve the availability of current market information. In addition, a bulletin on marketing timber has been prepared and distributed.

Timber is not often looked at as a crop but more as a source of income in emergency situations. Forestry Extension has initiated a long-term project to address the economics of forestry as an investment. At present, a two-workbook series is being prepared to compare a pine plantation investment with other forms of investment. Additional materials will be prepared in the future.

During the year a memorandum of understanding was developed between Clemson and the Louisiana State and Mississippi State Universities Logging and Forestry Operations Center. The result has been a new group called the Forestry and Harvesting Training Center. During the past year this group held four workshops at Clemson University, and the program will continue to provide training for professionals in the forest products industry.

Competitive forestry events for young people began on a pilot basis in September. Plans are to perfect the system and develop a statewide youth program in forestry which will culminate in these events designed to involve youth in understanding our forest treasures.
Department of Recreation and Park Administration

The Department of Recreation and Park Administration predetermines its educational, research and extension programs on the following concepts: that recreation is an essential element for the health and well-being of individuals; that the provision of recreation services, under the direction of a trained recreation professional, is a necessary function of government; that, while recreation is an eclectic profession which derives its scientific foundations from the basic sciences, neither a specialist in a basic science nor a person skilled in recreation activity can become a competent professional without knowledge of recreation philosophy and administration; that the faculty of the department must develop the ability to view recreation and leisure without geographic, political, ideological or financial constraints, and then must deliver educational services through teaching, research and extension based on that view.

Teaching

Substantive curriculum changes were initiated during the year and were well received by our students. Over the past two years we have experienced a decline in enrollment of approximately 100 students. This should result in an improved teaching and learning process. During the spring semester work was begun on a self-study which will be submitted to the Council on Accreditation, a quasi-autonomous body within the National Recreation and Park Association.

Research

Our research activity during the year has been stimulated by the presence of the Forest Recreation Research Unit of the Southeastern Forest Experiment Station and by increased support within the University's public service budget.

Six research contracts were in effect during the year studying such subjects as recreation impact on stream resources and data collection techniques in wilderness areas.

Twenty-three publications and presentations were produced by the RPA faculty on a variety of research subjects.

Extension/Continuing Education

Continuing education has become an integral part of the RPA program. The department hosted the second annual Summer School for Gerontology at the Outdoor Laboratory. Charlie White coordi-
nated the support services for the school while H. Brantley served as a member of the program planning committee as well as official host. Marcia Wallenius, recreation therapist, was a member of the faculty for the school.

Ann James developed the program and directed the third annual Therapeutic Workshop. Marcia Wallenius assisted and served as instructor.

The department hosted the ninth College Week for Senior Citizens, a high point each year in extension activities. Approximately 600 senior citizens were served in this residential program administered through the Outdoor Laboratory Office directed by Charlie White.

The department was also invited by the U. S. Army Corps of Engineers to conduct an executive development program during the spring. Evaluations by participants were very complimentary, and negotiations are under way which should continue the program for three more years.

Extension/Camping

The camping program continues to expand as we move toward the completion of the Outdoor Laboratory. A program for visually handicapped youngsters was added this year. Another new program, a camp for hemophiliacs, received an award from the American Camping Association for innovation and excellence in camping.

Extension Planning

The Threeforks Trail Camp Site Plan was developed by graduate assistant Michael Murdoch under the supervision of H. Brantley and H. J. Grove. The camp is to be operated by the Carolinas Methodist Conference. Grove prepared a plan for a recreation area on Clark Hill Reservoir for the S. C. National Guard. A class of graduate students assisted with the project.

For the South Carolina Department of Mental Retardation, a site plan was prepared which will lead to the development of an environmental education-outdoor recreation area. Revis Frye consulted with and designed an outdoor theater layout and lighting project for the Irmo-Chapin Recreation Commission. Brantley and graduate assistant J. Wiggins conducted an evaluation of the Sumter County Recreation Program.
A brand-spanking newly remodeled home and 38,000 more square feet of usable floor space—that’s what the growing College of Industrial Management and Textile Science is looking forward to as the result of multi-million dollar renovation.

The top to bottom refurbishment of Sirrine Hall, which houses the college, is being accomplished in two phases and is the first major renovation of the building since its construction in 1938. When completed in the summer of 1980, the building will contain 135,000 square feet (more than three acres) of usable floor space.

The $4-million plus project will provide additional space for classrooms, offices and laboratories to accommodate the college’s expanding enrollment.

Almost one-fifth of Clemson’s 10,000-plus student body is enrolled in the college, and undergraduate enrollment is growing at an annual rate of five percent. For fall semester 1978 the college had an undergraduate enrollment of 2,029. There were 94 graduate students and another 151 participants in the Clemson-Furman Master of Business Administration program.

The increasing demand for courses in business and management, expanded textile research, and the establishment of a full-blown Department of Accounting and Finance in 1974 have caused the college to grow at a rapid rate.

Phase one of the renovation, completed in 1978, covered modification of the entire building to adapt it for use by handicapped persons, relocation of looms away from classrooms, and adaptation of the former loom area for use as accounting and professional development offices and physical chemistry laboratories.

The first phase also gave the college 22,000 square feet formerly used by the U. S. Department of Agriculture’s three on-campus units and 16,000 square feet in Sirrine Hall’s attic which had been used for storage.

The USDA units (Agricultural Research Service, Agricultural Marketing Service and Economic Research Service) were relocated to more efficiently organized and easily accessible space in the Ravenel Research Center across Lake Hartwell from the campus.

In January 1979, Clemson trustees awarded a contract for the second phase work. Phase two calls for complete remodeling of those areas not included in phase one. Plans also include replace-
ment of partitions, floors, windows, heating and air conditioning systems, electrical systems and plumbing.

The project includes modernization of all textile laboratories—physical testing, color science, textile, fiber and chemistry, occupational safety and health, and finance and accounting. There will also be self-paced learning labs.

The new interior will include a modern facility for professional development programs (continuing education) which bring several thousand industrialists back to campus each year.

Plans include an updating of the research laboratory devoted to studying cotton dust standards as well as construction of research labs to study flammability.

The college offers 14 degree programs including undergraduate majors in accounting, administrative management, economics, financial management, industrial management, textile chemistry, textile science, and textile technology.

Advanced degrees are offered in economics, engineering management, management, management science, textile and polymer science, textile chemistry, and textile science.

Following is a look at the four departments within the college and the Office of Professional Development.

Department of Textiles

Employment opportunities for textile graduates have been outstanding, with more jobs than candidates being available in the primary as well as support corporations.

Since July 1978, textile faculty have published 16 papers in refereed journals, currently have nine papers in press, and are preparing an additional 10 papers for publication. In addition, three contributions to technical texts have been printed.

Textile faculty have also made 23 technical presentations before learned bodies and have organized, coordinated and/or lectured in 26 Professional Development courses attracting a total of 1,482 participants. Other professional activities include service on numerous professional organization task forces, advisory committees and editorial boards. During breaks and over the summer, two faculty members served on United Nations missions as technical experts in India and Eastern Europe.

As a continuing effort to strengthen knowledge of the textile industry as well as the machinery, chemical and allied suppliers, two
new department facilities have been established: An Audio-Visual Center and a Textile Products and Process Archive. Through these resources the department can better serve the textile industry by providing access to historical as well as current developments in products, processes and technology.

As a beginning, ATMA's endorsement was obtained and requests from manufacturers worldwide for one copy of literature or brochures describing product lines, technical manuals, applicable patents and audio-visual aids were made. This information has been indexed, excerpted and utilized as teaching aids in the form of slides, tapes, films and instruction manuals. This type of information has been a traditional source for our faculty to keep their students abreast of the industry, but until now all phases of our discipline have not been adequately coordinated.

Several slide/cassettes, videotape and 16mm film presentations used at exhibitions and for employee orientation have already been received. These are excellent resource materials. We hope to produce several videotape sequences of manufacturing innovations, and are using sales and marketing brochures to expand our slide holdings. We feel that both industry and academics will benefit by the coordination and accessibility of this information.

Major challenges for the immediate future include establishing and promoting a stronger, more positive image on behalf of the textile industry and encouraging young South Carolinians to pursue opportunities available through textile education. To this end, plans are under way to devote major effort and resources to promoting the positive aspects of textiles and recruiting quality students for our undergraduate and graduate programs.

Department of Industrial Management

Activities of the Department of Industrial Management continued to be varied, with emphasis placed on maintaining quality programs. Enrollment in these programs increased from 1,196 in 1978 to 1,454 in 1979. This represents a 23 percent increase in students majoring in these curriculums.

Enrollments by categories are as follows:

<table>
<thead>
<tr>
<th>Category</th>
<th>Enrollment</th>
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<tbody>
<tr>
<td>Undergraduate</td>
<td>1,241</td>
</tr>
<tr>
<td>Graduate Resident</td>
<td>62</td>
</tr>
<tr>
<td>Clemson/Furman MBA</td>
<td>151</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,454</strong></td>
</tr>
</tbody>
</table>
Degrees awarded in the 1978-79 academic year are as follows:

Bachelor of Science ........................................ 189
Master of Science ........................................... 9
Master of Business Administration .................... 29
Doctor of Philosophy ....................................... 5

TOTAL ........................................................... 232

Many of these graduates find employment in the textile industry in both the production and marketing areas. Graduates of the graduate programs have frequently entered the operational research and management science groups in the textile industry. A major portion of the graduates in the industrial management curriculum find employment in the textile industry in the Southeast.

A major activity was the beginning of a Small Business Development Center to serve a 12-county area in the Piedmont. This activity is financed by funds appropriated by the South Carolina Legislature and the Small Business Administration. Services include providing information and consulting services to small businesses as well as conducting continuing education courses dealing with subjects of interest to these firms. Clemson is a member of a consortium composed of the University of South Carolina, Winthrop College, and South Carolina State College which serves the Small Business Development Center of South Carolina.

Department of Economics

Effective teaching, scholarly research and informative community service continued to be trademarks of the Economics Department. The 1978-79 academic year could best be described as an extremely productive one for the faculty.

The year saw a 16 percent increase in the number of students enrolled in economics courses. As a result of the growth in the number of majors in the College of Industrial Management and Textile Science, the courses in economics principles, labor and intermediate theory were primarily responsible for the enrollment growth. The number of economics majors, both the B.A. and B.S. degree programs, has continued to grow. More undergraduate degrees were awarded in 1978-79 than in any other year in our department's history. To meet the new and different challenges that are confronting our college's graduates, the department undertook a massive restructuring of the B.A., B.S. and M.A. degree programs,
which included changes in course offerings and amendments to curriculum requirements.

A voluminous amount of scholarly research was performed during the year by the 20 economists within the department. A summary of research accomplishments shows six books and monographs; nine technical reports, either completed or in final stages in compliance with grants from such agencies as the U. S. Department of Labor, National Science Foundation, American Enterprise Institute, The National Right-to-Work Legal Defense Foundation, Water Resources Research Institute, and the state of South Carolina (Legislature and Budget and Control Board); 44 articles published in professional journals; 17 papers presented at professional meetings; and faculty members served as five chairpersons and nine discussants at professional meetings of national and regional economic associations. These research efforts spanned a vast array of economic issues (e.g., cotton dust standards, unemployment insurance, regulation of industry to tax reforms, freedom and enterprise, the role of government in a dual economy, and economics of pollution and the environment.)

Special significance should be given to Drs. Holley Ulbrich’s and Bruce Yandle’s book, Managing Personal Finances, which received partial support by the J. E. Sirrine Textile Foundation and Drs. Hugh Macaulay’s, Richard McKenzie’s and Bruce Yandle’s book, Economic Consequences of the Cotton Dust Standard, which could deter the current trend of federal regulation of the textile industry in South Carolina.

Funding from the J. E. Sirrine Textile Foundation made possible a Center for Economic Education, which in January 1979 was designated an affiliated center by the Joint Council on Economic Education.

While the focus of the economic education program continued to be the workshop courses—Economics 750 and 751—funding from the Foundation and cooperation with other agencies made possible two new types of activities during the year: in-service programs and a quarterly newsletter for teachers.

Economics 751, Current Issues in Economics for Teachers, was taught in Greenville one night a week in both the fall and spring semesters, giving teachers an opportunity to refresh and enhance the economic education skills acquired in the basic course. Twenty-six teachers participated.
Three sections of Economics 750 were taught in summer 1978, two under the sponsorship of the South Carolina Council on Economic Education and one under the sponsorship of the Greenville Chamber of Commerce. Fifty-six teachers from seven school districts participated. A satellite center at Presbyterian College, running the same course under Clemson auspices, trained an additional 73 teachers from Greenwood and Laurens counties.

Eleven in-service programs were conducted by the center director in six school districts and one statewide meeting, ranging from one hour to four days in length. Three of these, held in Columbia, Florence and Oconee counties, focused on introducing teachers to the economic education laboratory kit, "People, Production, and Profits." In addition, presentations on the kit were made at the annual statewide meeting of the South Carolina Council on Economic Education and at the annual meeting of the national Joint Council on Economic Education in Portland, Oregon. The other eight in-service programs dealt with basic concepts and current issues in economics for teachers in Fairfield, Lexington, Pickens and Greenville counties. The in-service programs provided teachers with ideas and materials for introducing or enhancing the teaching of economics in their classrooms.

A newsletter was initiated in September which is being sent to over 400 teachers and economic educators, most of them in South Carolina. Each issue focuses on a specific economic topic and provides activities and resources for classroom use. The first issues dealt with inflation, competition, regulation and banking. Forthcoming issues include unemployment, energy and international trade. A target circulation of 1,000 is the goal for the end of the 1979-80 academic year.

Department of Accounting and Finance

The Department of Accounting and Finance continued an established pattern of growth during 1978. In this one year, the number of majors in financial management increased by 33 percent to 381, while accounting majors increased to 274. Students enrolled in courses in accounting and finance now exceed 2,000 per semester.

The faculty consists of 21 capable individuals including 10 with doctorate, 5 nearing completion of the doctorate (ABD), 2 actively working toward a doctorate, and all with a master's degree. Eleven of the faculty members are certified public accountants, 3 are certified management accountants, and 2 are certified data processors.
Three others have nearly completed the requirements for their certificate in public and/or management accounting.

The demand for Clemson graduates in accounting and finance continued to grow. Six of the "Big Eight" Certified Public Accounting firms recruited our students on campus during 1978, as did other state and local CPA firms. Numerous positions were available to both accounting and financial management graduates in areas of business, industry and government. An increasing number of graduates in finance have accepted employment with banks and savings and loan institutions.

The faculty has increased its research activities with a corresponding increase in publications and presentations. Faculty members have been active in the performance of public services through their professional organizations such as the National Association of Accountants, the South Carolina Association of Certified Public Accountants, the American Institute of Certified Public Accountants, the American Accounting Association, the Institute of Internal Auditors, the Data Processing Management Association, and through the various regional organizations in the area of finance.

During the year, an ad hoc committee to develop a professional program in accountancy analyzed the recommendations of the American Institute of Certified Public Accountants in regard to the education needed in preparation to enter the accounting profession. The ad hoc committee concurs in the need for 30 semester credits of work in an accounting program past the baccalaureate degree which would lead to a master's degree. The committee has developed plans for proposing an integrated five-year professional program which would retain a four-year program for the majority of the accounting majors. The programs are intended to comply with proposed standards and lead to the accreditation of a professional program in accountancy at Clemson.

Office of Professional Development

Self-development and continuing growth for the professional has never been as important as it is now. Every day new techniques are developed and new knowledge is acquired which could be of vital importance to the success of an operation. During 1978-79, more than 4,000 Professional Development attendees kept up with these continuing and rapid changes by participating in more than 125 courses.

Knowledge of new developments can be obtained through various means. However, participating in Professional Development
programs away from the office has proven to be one of the most successful of all the methods offered for learning. At Clemson, Professional Development participants have the opportunity to explore and concentrate fully on their immediate objectives. Being away from the office means freedom from interruptions; it means having a continuous span of time in which organizational practices and techniques can be evaluated in the companionship of other professionals who share the same important objectives.

More than 1,000 different companies enrolled their employees in courses on management, textiles, economics and accounting. The top five companies in terms of attendance were: Springs Mills, Badische, E. I. DuPont, Greenwood Mills and Clemson University.

Presenting authoritative, up-to-date information with immediate benefits is one reason for the 1978-79 success story. Another is the opportunity for attendees to exchange ideas and information with a national cross-section of peers.

**COLLEGE OF LIBERAL ARTS**

It has been said that no university can ever become a great university without a strong program in the humanities and the social sciences. The College of Liberal Arts recognizes that dictum. It is founded upon 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 those lofty ideals, the College of Liberal Arts, like all colleges at Clemson, is steeped in a tradition of practical endeavor.

The college is made up of the departments of English, Languages, Music, History, 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.

Sixty-five percent of the faculty hold the doctorate; 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 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, gov-
ernment organization, the impact of industrial development on society, mental health and alcoholism, among others. Members of the Department of English have proved very valuable to industry by conducting seminars in technical report writing.

The Department of Languages also has a very practical, business orientation as it encourages Clemson students to major in fields such as engineering and textile science and minor in a modern foreign language. That is a forward-looking career option when you stop to remember that South Carolina is fourth in the nation in the amount of foreign investment in the State.

Through the Robert A. Taft Seminar in Government and Practical Politics, the Department of Political Science provides the State's teachers with practical knowledge of how government works, and arms them with information to involve young people in government decision-making. It is a measure of the quality of the College of Liberal Arts that this program has been called the finest in the United States by the Taft Institute's director.

The Department of Political Science also sponsors the University's Model United Nations Representation Team.

One important contribution of the college to the University is sponsorship of a large number of student and University organizations and extracurricular activities, many of them open to the public without charge.

The Department of English sponsors the Clemson Players, the Debating Team, and assists with management of the Tiger, the Chronicle and the Calhoun Literary Review. It presents annually a well-known and widely attended Children's Literature Symposium. The department continues to conduct 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.

The Department of Music sponsors and manages the Concert Band, the Marching Band, the University Chorus, the Liberal Arts Chamber Music Series and the University Concert Series.

The Department of Languages annually sponsors "Dionysia," a foreign language and drama festival with several dozen casts from four states competing in four languages. It also sponsors a language declamation contest which draws more than 100 participants from several states. And it conducts a foreign study program in France and South America.
Professional Activity and Scholarship

The Department of History continues to spread the name of the University through book reviews published in 89 newspapers in 38 states with a readership in excess of three million people. It is the only such free service to newspapers sponsored by an institution of higher learning.

The department also sponsors the popular radio program, "History and Opera," hosted by Jerome Reel and broadcast over all public radio stations in South Carolina and two stations out-of-state. The program is now being considered for national distribution over the National Public Radio network.

Another member of the history faculty, Laura Becker, was host and commentator on another radio program, a one-hour presentation on women's history titled "Women—Themselves!" The program was sponsored by a grant from the South Carolina Committee on the Humanities.

The Department of English publishes the South Carolina Review, a distinguished journal providing a forum for distinctive literary scholarship and original poetry and fiction. A $2,000 grant from the National Endowment for the Arts helped underwrite the cost of publishing 1,400 copies of the journal this year.

The Journal of Political Science continues to be sponsored by the Department of Political Science and edited by members of the political science faculty.

COLLEGE OF NURSING

The mission of the College of Nursing is achieved through its academic programs—the baccalaureate, associate degree and graduate program; through continuing education offerings; and through research development. Significant achievements were noted in all areas, due to the involvement of highly motivated faculty and students enjoying the first year in the modern, exceptionally well-equipped College of Nursing building.

Undergraduate Programs

Baccalaureate Degree Program

A two-year search for a director of the Baccalaureate Degree Program ended in the appointment June 1 of Mary Wilhite, Ph.D., formerly of Wichita State University and the University of Tulsa.

The faculty made substantive changes in course offerings during the year. Much attention was given to evaluating clinical per-
formance. Faculty attended several workshops in this area, and during March a workshop was held on campus led by Harriet Schneider, Ph.D., formerly of the Evaluation Department of the National League for Nursing.

Both programs used closed-circuit television for teaching. This required considerable adjustment of individual teaching style and methodology.

Three faculty worked with physician preceptors during the year to increase their skill in primary care assessment.

More than 120 students enrolled in the baccalaureate degree program in 1978-79; 69 received the Bachelor of Science degree.

**Associate Degree Program**

The faculty continued to revise the curriculum and made substantive changes in course offerings.

A contract with the Appalachian II Health Department lets students observe the department's work to improve their ability to refer clients for additional care.

**Graduate Program**

The graduate program curriculum committee recommended several changes in course offerings and completed revision of the four-semester program.

Eighteen students were enrolled during the year; five received the Master of Science in Nursing degree. A federal traineeship grant of $29,774 awarded to the college provided tuition and a stipend for nine students.

**Department of Continuing Education**

In its second year of operation, the Department of Continuing Education enrolled 546 nurses in 30 separate programs.

Emphasis has been on designing offerings which recognize the varied educational backgrounds and clinical interests of today's nurse. Select offerings were at the post-baccalaureate and post-master's levels. Some were explicitly designed for the licensed practical nurse. Still others were for school nurses, teachers, critical care nurses and maternity nurses. A post-doctoral workshop on Theory Development offered in conjunction with the Department of Nursing Research was attended by 22 nurses from around the country, including California, Kentucky, Michigan, Massachusetts, Virginia, Maryland and Florida.

Interdisciplinary programs attracted social workers, health educators and community health planners. Public service offerings
such as the series on cardio-pulmonary resuscitation reached members of the local community.

The fourth year of a five-year Critical Care Nursing/Continuing Education Project was funded by a grant from the Appalachian Regional Commission to the Emergency Medical Services Council of the Appalachian Region. More than 270 nurses expanded their knowledge and enhanced their skills in critical care nursing through this project.

Under contract with the South Carolina Department of Health and Environmental Control, production was completed on the continuing education videotape series: "Community Health Nursing: The Family—The Basic Unit of Care." Faculty in the baccalaureate and graduate programs were the teachers, with some assistance from two of the staff from DHEC's Department of Nursing. The series will be carried by the Health Communications Network beginning in September 1979.

The Department of Nursing Research

Gloria Tanner, Ph.D., was appointed director of the department in June 1979.

A two-part study of the graduates of the class of 1978 was completed. One phase of the study dealt with the graduates' perceptions of factors influencing their scores on the state board licensing examinations. The second phase of the study examined the relationship between scores on selected academic variables and state board scores achieved by these same graduates.

Research by the assistant to the dean for research development related to individuals with essential hypertension. The data was collected and is being analyzed. This research was supported by a Faculty Research grant.

Priscilla Kline, a member of the baccalaureate degree faculty, was awarded a Faculty Research grant as co-investigator for the study "Regulatory Affects of Biogenic Amines."

Conferences were held with doctoral-level faculty members to begin developing a grant proposal to submit to the Division of Nursing for funds to conduct cluster studies.

Memos were sent periodically to faculty members regarding the availability of research funding. A research seminar was conducted by S. Joan Gregory, Ph.D., R.N., who presented her study, "Factors Related to Clinical Performance of Baccalaureate Nursing Students."
After considerable planning, the Department of Computer Science began functioning on July 1, 1978. Proposals for the B.S. and M.S. programs in this discipline are currently being considered by the Commission on Higher Education. A. J. Turner, Ph.D., is the head of this new department and C. R. Dillon, Ph.D. was named head of the Department of Botany.

The College of Sciences is responsible for 30 percent of the University's teaching load with 23 percent of the total teaching faculty. The demand for freshman classes in biology, chemistry, mathematical sciences and physics has expanded far beyond expectations based on a total enrollment ceiling. This is primarily due to a shift in the distribution of students toward more technical curricula for which the College of Sciences provides the foundation courses as a service. The number of majors in scientific disciplines has remained essentially constant. This is probably due to continued concern over health affairs and environmental issues, and a surge of interest in energy problems.

The faculty in the sciences currently have $2,792,000 in grant and contract funds from federal agencies and industries to support research.

Biology Program

Approximately 1,500 students were enrolled in the Biology Program during the 1978-79 academic year.

The introductory biology courses offered were reviewed and revised after consulting faculty and student representatives from participating academic disciplines. Comprehensive subject outlines were developed and distributed to faculty in biochemistry, botany, microbiology and zoology, to integrate introductory course content into upper level programs.

Four laboratory manuals were revised and published by the faculty, and two new instructors were hired to help implement the experimental approaches emphasized in the laboratory. Individual student research projects were introduced as a part of the introductory biology course for science majors. Instructors assisted students in designing and executing experiments emphasizing hypothesis formation and data analysis.

The faculty participated in several high school student tours and lecture programs during the past year, and more involvement in such projects is planned for the future.
Department of Biochemistry

The Department of Biochemistry had a very successful year. The Bachelor of Science degree program enrolled 62 students and 19 pursued graduate degrees in biochemistry. Nearly 800 students were enrolled in biochemistry courses. Two M.S. and seven B.S. degrees were awarded.

One of our undergraduate majors deserves special recognition. Jane W. Cutler of Greenville, who made straight A's throughout her undergraduate career, received the Faculty Scholarship Award during the May commencement exercises. Jane will attend graduate school at Purdue University this fall.

Seven outside research grants were held by faculty members—three from the National Institutes of Health, and one each from the National Science Foundation, Muscular Dystrophy Association of America, Water Resources Research Institute, and American Heart Association. Sponsored research grants-in-force totalled more than $300,000. The projects included research dealing with muscular dystrophy, red blood cell maturation, special serum proteins (complement) and herbicide degradation.

Ten papers were presented at national meetings and nine regional meetings. Eighteen outside invited seminars were presented and 10 manuscripts were published. Twelve seminar speakers visited the department.

Department of Botany

The department passed the year under an acting department head while recruiting for a new head, a mycologist and an ecologist. A new head has been appointed and the mycologist position filled, while recruiting continues for the ecologist position.

The department introduced a new relevance course at the undergraduate level. All courses have maintained or grown in enrollment.

Research activities with support from several agencies (World Health Organization, Water Resources Research Institute, etc.) have continued along several lines, including a floristic survey of the Trotter's Shoals dam site, investigation of the ecology of the noxious weed Brazilian Elodea, and research on fungi as mosquito control vectors. Departmental research continues in several areas of physiology, cell development, biosystematics and ecology.

Physical and instrumental improvements have enhanced the department's teaching and research efforts. The herbarium storage
capacity was enlarged, but additional capacity will be needed shortly because of increased collection efforts and an active exchange program.

The department continues to serve the general public, industry, agri-business and the medical profession in identifying higher and lower plants and fungi.

**Department of Chemistry and Geology**

National Science Foundation grants were received by Garth Spencer, James Fanning and R. A. Abramovitch, and two NIH grants were received by Abramovitch, head of the department. Keith McDowell, an Alfred P. Sloan Fellow, received a research corporation grant. Joe F. Allen received an extension of his EPA grant and an additional grant from EPA. Abramovitch received a grant from Merck and Company. A. L. Beyerlein and J. E. Geldard received a contract from the Los Alamos Laboratories.

During the year the chemistry faculty published 21 papers and 3 books, presented 18 papers at scientific meetings, and gave 27 invited lectures in the United States and abroad. The geologists published one book, gave three invited lectures, and presented three papers at scientific meetings.

Perhaps the most dramatic improvement has been in the area of major equipment acquisition, including major additions such as a Hewlett-Packard 5985-B Gas Chromatograph/Mass Spectrometer/Data System and eight computer terminals, in addition to minor hardware such as microscopes for the geology undergraduate labs. This turn of events should improve our productivity, teaching and ability to recruit graduate students and faculty.

Our Distinguished Industrial Seminar Program under the supervision of Donald B. Black arranged talks by the presidents or vice presidents of Celanese Chemical Co., Shell Chemical Co., Union Carbide Chemical Corp., E. I. DuPont de Nemours Co., Ethyl Corp., and Olin Corp. We also had a very active research seminar program during the year.

Among honors received by the faculty: Joe Allen was elected secretary for the International Congress for Individualized Instruction and served on the Board of Directors of that Congress; James Fanning spent nine months in Washington, D. C., as program administrator for the National Institutes of Health, Cancer Division, Inorganic Chemistry Branch; and George Haselton was invited to continue his collaboration with the U. S. Geological Survey. A num-
ber of our faculty have been invited to give plenary lectures at international symposia.

The student affiliate chapter of the American Chemical Society was named one of only 58 commendable chapters out of 710 in the United States.

**Department of Computer Science**

During its first year of operation, the department was primarily occupied with the development of new degree proposals, the recruiting of departmental faculty, and the revision of courses and curricula.

Proposals for B.S. and M.S. degrees in computer science were completed and approved by the University. They were submitted in January to the South Carolina Commission on Higher Education, which had not acted on them at the end of the 1978-79 year.

Recruiting efforts for a permanent department head culminated with the appointment of A. J. Turner, effective May 16, 1979. One associate professor, one assistant professor, one visiting assistant professor, and one lecturer/cooperative education coordinator were recruited for the next academic year. One faculty member resigned to accept an industrial position in another state.

Discussions and initial work began on the course offerings as a whole in computer science. Extensive revisions are planned during the 1979-80 year both in service courses and in courses designed primarily for majors.

During the academic year, 57 sections of computer science were offered by the department, 29 of which were taught by faculty of the Department of Mathematical Sciences as an interim measure until the Department of Computer Science is fully staffed. The total number of students enrolled in these 57 sections was 1,495.

**Department of Mathematical Sciences**

Though the University maintained a relatively stable student population during 1978-79, the number of undergraduate majors in the mathematical sciences increased over the previous year by 25 percent, to 239 declared majors. The undergraduate credit hour production of the department continues to be one-eighth that of the University while graduate credit hour production grew by more than 13 percent.

Richard D. Ringeisen, Ph.D., was named associate department head effective August 1, 1979.
The department is near completing four years of the NSF Grant, "An Alternative in Higher Education in the Mathematical Sciences." The applications-oriented M.S. program spawned by the grant has produced 75 graduates in the past three years. Local government and industry organizations continue to cooperate with our faculty to provide "real world" mathematical problems which serve as projects for graduate students. Government and industry are hiring graduates of this program at salaries averaging $20,000 to $23,000 per year. Twenty-one faculty members from colleges and universities in 13 states and two foreign countries have visited the department for at least a semester during the last three years to study our applications-oriented M.S. program, which blends applied and pure mathematics, computing, operations research and statistics.

In 1978-79, the department altered its Ph.D. program to reflect its mathematical modeling and problem-solving emphasis. Graduates from this program and from the management science Ph.D. program (administered jointly with the Industrial Management Department) are obtaining industry jobs at salaries averaging nearly $25,000 per year.

The department continues its Office of Naval Research contract into the ninth year. Sampling techniques developed in this product are being used by the U. S. Navy to evaluate contracts totaling hundreds of millions of dollars. During 1978-79, the department successfully negotiated a unique cooperative research agreement with the U. S. Department of Agriculture/Cotton Quality Research Station.

Members of the department faculty have achieved professional preeminence. One of our faculty is a member of the Conference Board of the Mathematical Sciences. Two members of the faculty chair important committees of the Society of Industrial and Applied Mathematics. One is a national lecturer for that Society. Another is a regular consultant for the U. S. Defense Department and a national lecturer for the Mathematical Association of America. Still another is president of the Southeastern Section of the MAA and also is chairman of the College Board's Committee on Calculus Development. One is editor of a major journal, and another is a fellow of a professional statistical society.
Department of Microbiology

During 1978-79 the department graduated 45 students with the B.S. degree in microbiology and seven students with the M.S. degree. There were more than 200 undergraduates and a total of 26 graduate students majoring in microbiology, and some 925 students were enrolled in microbiology courses.

The numerous research activities described in last year's report continued and several new projects were initiated. These include studies on gene control, which may lead to the use of certain chemical metabolites for treating some types of cancer and to controlling development of certain insect pests. The findings of this research could have far-reaching impacts in a variety of areas in which the control of cell growth and development would be a valuable tool for man.

Another new research project deals with the problem of infections that may result when artificial bone prostheses are used, for example as when a hip joint is replaced. A serious problem in the health field is that many antibiotics, such as penicillin, are no longer effective in curing bacterial diseases. This is because the bacteria have developed a mechanism to protect themselves against the antibiotics. One investigator has discovered that some of the resistant bacteria can be made susceptible to the antibiotic once more, if the drug is given in conjunction with certain analgesics.

Microbiology faculty have participated actively in the South Carolina Branch of the American Society for Microbiology. One member took office as president of this group, another was elected secretary-treasurer and a third was elected vice-president. Faculty participated in state and national meetings, presenting research papers and organizing symposia, and several presented invited seminars at other universities.

The "Outstanding Microbiologist" award, given by the South Carolina branch of ASM, was presented posthumously to John Howard Bond, who had served Clemson University and the State for some 22 years.

Department of Physics and Astronomy

During the 1978-79 academic year, instructional and research programs of the department were actively pursued.

The area of atmospheric physics has developed into one of the better research programs in this field in the Southeast. The work of this group has to do with the way hailstorms develop, and the
factors that influence the growth of hail particles. Active work concerning the movement of hurricanes and the genesis of tornadoes in tropical storms is also being carried out. These studies are financed by grants from NASA and the National Science Foundation, whose total value exceeds $200,000.

The biophysics research group continues to function actively. Its work centers on the mechanisms involved in the self-repair of DNA molecules that have sustained damage from radiation. In particular, the roles played by certain enzymes in this repair function are of interest. Since cancerous growths are often initiated by radiation-induced DNA changes, the importance of these studies in furthering the eventual conquest of cancer is obvious.

The Ph.D. program in physics at Clemson marks its 15th anniversary this year, the Department of Physics and Astronomy having conferred the first physics Ph.D. awarded in South Carolina in 1964. Since then nearly 70 doctoral degrees have been conferred, and the department’s program has grown into the largest physics/astronomy research and graduate education activity in the State. During the past decade about five Ph.D. degrees have been awarded annually, and their recipients are active contributors to South Carolina’s rapid growth in industry, research, technology and education.

The department’s level of external grant funding has almost tripled in the past five years. The recent national upsurge in energy research has greatly increased the demand for physics Ph.D.’s, to the point where it now far exceeds the supply. Our programs will play an important role in the State’s energy future, as a supplier of trained personnel as well as a research facility.

The department’s planetarium continues to be a popular and useful public service facility. Apart from its instructional uses, it serves as a unique and entertaining way of introducing astronomy to elementary and secondary school students and to the public at large. Its presentations, which are available to organized groups free of charge by appointment, are attended by more than 5,000 persons annually.

**Department of Zoology**

In the fall semester, 147 students were pursuing the B.S. degree in zoology. Of our graduate students, 19 were in the M.S. and 21 in the Ph.D. program. Zoology currently has the largest doctoral program at Clemson. During the past year, 33 students graduated with a B.S., four with an M.S. and one with a Ph.D. degree. The
first Byron Ross Ingram Jr. Memorial Scholarship was awarded to Leah Ellen Burnett. Patricia A. Gowaty, a doctoral candidate, won the Louis Agassiz Fuertes Award of the Wilson Ornithological Society.

Faculty research and training activities were supported by 10 major outside grants (five from the National Science Foundation, two from the U. S. Forest Service, and one each from the Air Force Office of Scientific Research, the South Carolina Wildlife Department, and the National Institutes of Health). Other small grants were received from Sigma Xi, the National Geographic Society, The Chapman Fund, the American Philosophical Society, the Southern Regional Education Board and the U. S. Fish and Wildlife Service. Scholarly activities during the year included 30 papers presented at national scientific meetings, six papers read at regional meetings and 21 manuscripts (excluding abstracts) published in scholarly journals or books. Our major research thrusts continue in the general areas of ecology (including limnology), behavior, evolution and physiology. Other programs in developmental biology and genetics are under way.

Several members of our faculty are serving the nation and state in special professional capacities. John P. Wourms is associate editor of the Journal of Experimental Zoology. Sidney A. Gauthreaux Jr. is on the Executive Committees of both the Animal Behavior Society and the Wilson Ornithological Society and is on the S. C. Heritage Trust board of directors. James E. Schindler was elected chairman of the Board of Scientific Advisors of the Highlands Biological Station and is on the regional committee selecting nominees for Rhodes Scholarships.

During the year faculty members were invited to give at least four seminars at other institutions, and 16 outside speakers visited our campus and presented seminars to our faculty and students. Service activities continue to focus on the vertebrate collections. With the support of a special grant from the Alumni Fund, the Harllee collection of eggs has been housed properly and is being completely catalogued. We now have 5,487 clutches (23,373 eggs) representing 640 species of birds.
GRADUATE STUDIES, UNIVERSITY RESEARCH AND COMPUTER CENTER

The Graduate School

Enrollment for the 1978 fall semester remained essentially constant relative to that in 1977. Total enrollment was 2,230 with 210 in doctoral degree programs, 492 in Master of Arts and Master of Science degree programs, 895 in professional master's programs, 51 in Education Specialist degree programs, and 582 students with undeclared majors. Of the total enrollment, about 500 were enrolled off campus. In addition, 152 students were enrolled in the Clemson-Furman Master of Business Administration program.

A total of 649 advanced degrees were awarded during the academic year, 42 of which were doctor of philosophy degrees.

The third annual workshop for graduate advisors was held in August 1978 and was attended over the two-day period by approximately 80 faculty and staff.

Major accomplishments of the Graduate Council include formulation of guidelines for eligibility to serve on graduate student advisory committees as well as formulation of a policy on post-baccalaureate students.

A study of admission requirements for foreign graduate students was initiated and is in progress. Part of this study involves a questionnaire sent to the majority of graduate schools in the United States. The survey results have been requested for inclusion in a report by the Task Force on Foreign Students, sponsored by the Council of Graduate Schools in the United States.

Office of University Research

This office is responsible for providing information and assistance concerning all aspects of the total University research effort to faculty members, departments, colleges and other administrative units. Assistance in the preparation and submission of applications for sponsored research, instruction and public service programs is provided by the office. The office also provides University liaison between the institution and all public and private national and local research-related organizations and/or entities.

The revised University General Assurance of Compliance with DHEW Regulations for the Protection of Human Subjects was implemented, and guidance and executive support was provided to the University Committee for the Protection of Human Subjects.
(37 active projects). Guidance and executive support is also provided for the Biomedical Research Support Grant Committee (10 active awards), the Faculty Research Committee (56 active awards) and the Laboratory Animal Welfare Committee. Another volume in a continuing series, *Clemson University Faculty Publications 1975-77*, was prepared, edited and printed. The office processed 272 proposals of all types on behalf of the faculty.

**Computer Center**

The 1978-79 year saw a number of major changes at the Computer Center and continued progress toward a stable computing environment.

In September 1978, the Center converted to a new operating system—MVS. A great deal of planning and effort went into ensuring that the conversion went smoothly, and that it was as transparent as possible to users. The performance of MVS has turned out to be surprisingly good, enabling the Center to continue providing good computing service through the peak end-of-semester periods.

In June 1979, an IBM 3033 computer was installed as a replacement for the IBM 370/165-II, which did not have the capacity for meeting the expected computer needs in 1979-80. The installation was the culmination of a year's intensive efforts involving many people at the Center. The entire procurement process, from writing and issuing the RFP to installation, although arduous, was accomplished with none of the problems commonly associated with a large, competitive computer acquisition. Both the RFP and the associated benchmark have become standards of sorts, with copies being requested by a number of installations throughout the country.

In contrast to other state data processing installations, Clemson's Computer Center has experienced very little staff turnover in the past year. However, a number of employees are relatively new, and training them and providing continuing education for more experienced employees is a major concern.

The Center has continued to bolster its claim to being a major research and development facility with the widespread distribution of its software products, the presentation of papers by staff members at professional meetings, and the national recognition awarded to the Computer Center newsletter. With the computer system becoming more and more stable, increasing emphasis will be placed on research and development efforts in the coming years.
The major problems which were anticipated a year ago have now been successfully addressed, and the Center is in a position to offer the University and the State a consistently high level of computing service. Other than severe shortage of office space at the center, there are no outstanding problems.

Division of Administrative Programming Services

The Division of Administrative Programming Services (DAPS) is responsible for the creation and maintenance of computerized information systems to meet the needs of the University administration. The division consults with administrative departments and assists them in designing computerized and manual systems to support routine operational needs as well as management decisions. A key ingredient in DAPS' mission is to design systems for various departments in a coordinated fashion that revolve around an integrated University data base. Administrative areas do not operate in a vacuum, but rather they support each other through procedures and information in discharging their responsibilities. This fact must be taken into account as DAPS designs systems that support administrative areas. During the 1978-79 fiscal year, DAPS has implemented portions of the following systems:

1. A Physical Plant job order system was implemented for tracking labor and supplies expended on work orders and maintenance orders. All charges are posted directly to the consuming department's account at appropriate intervals.

2. A position control, personnel and payroll data base that integrates information key to these functions was implemented. Included are position budgets, tighter position control, and a provision for decreased lead time for producing a University payroll.

3. Several departments have worked with DAPS in installing, using and planning for word processing equipment. DAPS has assisted in ensuring that word processing hardware and procedures are used effectively in conjunction with existing or planned information systems.

4. A significant amount of effort has been expended to design and begin programming an integrated student data base. This project is a joint effort of DAPS, Student Affairs, and Business and Finance. System testing and implementation will begin in January 1980.

5. The alumni information system has been re-designed and is being programmed. Several operation improvements are being
made on the system, which has been in existence for about 10 years. Plans are in place to link the alumni data base with the IPTAY data base.

6. The financial aid applicant system was implemented. This is an on-line system to help the Financial Aid office keep track of all applications for aid.

7. The affirmative action goals systems was implemented. It records progress made against affirmative action goals set by administrative areas.

8. An on-line accounting, grant and contract, budget, and fund group inquiry system was implemented to be used by all interested University departments. This provides a quick and up-to-date reference into these areas from a terminal.

9. An improved version of the payroll system was implemented to provide an easier method to add new deductions and bring all software in the system up to maintainable standards.

10. The existing on-line student master, course enrollment, and emergency address systems have been combined into one, allowing for much easier use by Student Affairs.

11. The student registration and collections system was completely stabilized. The last portion of the system, financial aid accounting, was successfully implemented.

12. Several improvements were made in the budget preparation process allowing the spring budget to serve as the basis for position control throughout the following fiscal year.

13. The football scouting system was completely revised and expanded, providing for a complete offensive and defensive analysis.

14. A system was written to coordinate large University mailings to help prevent one person from receiving several copies of the same information.

15. The department assisted in administering locally the statewide cost-of-living raise effective June 22, 1979.

Indirectly related to University systems, but nevertheless important, the following items have been accomplished in 1978-79:

1. IBM 3270 video units were installed in several administrative areas. These are reliable terminals supported by the on-line system software package now being installed.

2. The card equipment in Administrative Data Processing has been replaced by Key/Diskette equipment. This has proven
to be less expensive and more effective than the current equipment.

3. An integrated data dictionary was implemented 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.

4. A tape volume management system was implemented in all systems supported by this department. This has improved data security and allows re-thinking of the requirements for data protection and backup.

5. Computer Output Microfiche (COM) is now being used for several large financial reports, representing significant cost savings for paper and storage space.

In conclusion, three key points emerge as DAPS continues to design and support administrative systems:

- All systems must be developed in a coordinated fashion around a central University data base, recognizing the fact that administrative areas work in a supportive fashion and share information and procedures.
- Information systems development must be a joint effort of DAPS and the using department(s). A systems effort cannot be effective without the understanding and effort of all affected parties.
- Information in administrative data bases must be made more readily available to all University departments having authority to use it, not just the department responsible for the input. On-line systems recently developed and improved security procedures are making this more feasible.

Division of Information Systems Development

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

Contracts during the year included:

Appalachia II District Health Department—Maintenance was performed on the system developed to handle health care and appointment requirements of the department.
Division of Administration—Office of the Governor—Maintenance and refinement continued on the system which maintains records for persons trained under the Comprehensive Manpower Program.

Department of Social Services—Several areas of support were entered into to support DSS in its growing computer information system requirements.

(1) Education and training—Programming techniques, database management and interactive program development were stressed.

(2) IV-D—A system for child support enforcement including data capture and payment distribution was enhanced.

(3) Title XX—The system developed by DISD was enhanced and maintained.

(4) Medicaid Management Information System—A large-scale, on-line, claims processing and reporting system was designed and implementation begun to support processing for all types of Medicaid claims. In the future this system will process seven million claims annually and maintain records on Medicaid recipients and providers. Major subsystems include provider, recipient, reference, claims processing, management reporting and surveillance reporting.

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

Lander College—Continued development and support of Lander's data processing needs in student and alumni records, payroll and course-load prediction.

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

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

The library collections continue to grow in size and quality. The total count is now 762,408 volumes. In addition there are 18,005 reels of microfilm, 343,746 units of microfiche and 31,504 microcards. Strong emphasis is placed on collection development to support the curricula and research of the University. Clemson has for many years been a selective depository for U. S. government publications, and the collection of 199,452 volumes has also been carefully assembled to meet the demands of the curricula and research needs of the University.

Special Collections continues to be appreciated by on-site visits by scholars, correspondence with persons seeking information, as well as by Clemson faculty and students. On May 2 a special exhibit and other attractions of an informational nature marked the centennial of the birth of Governor James F. Byrnes.

To supplement its collections during the year, the library borrowed 2,026 items from other libraries and loaned 2,776 to other libraries. For many years Clemson borrowed many more items than it loaned. These figures reflect the growing strength of the collections and library service beyond the Clemson campus.

A count is made of library users as they leave the building. In 1978-79 the number totaled 491,600. Although statistics indicate that some 202,445 books were checked out to users, this number by no means indicates the total use of the collections. Experience shows that many more books are used in the building than are circulated for use outside the building.

The extension of library hours from 11 p.m. until 1 a.m. Sunday through Thursday from November through the spring semester has been greatly appreciated by students and will be continued for the fall and spring semesters 1979-80. Although service from the library staff is not available after 11 p.m., students have access to the collections of books, journals and documents for 106 hours each week.

The application of computer technology to libraries has affected nearly every aspect of librarianship. In 1968 Clemson installed an automated circulation system. This innovation was followed by direct-line access to a data base in Ohio where the catalog records of the Library of Congress as well as many other libraries in the United States and Canada were available to Clemson as well as the catalog cards of these libraries.
Then came direct on-line access to bibliographic information, a system in which about 100 indexes and abstracts are stored in a huge data base in California—the Lockheed Dialog Information Retrieval System. The time of faculty and research personnel in searching bibliographies was reduced from days of manual searching to minutes through use of the computer. Most recently inter-library loan requests have been speeded up through use of computer applications.

In the cataloging of publications, the adaption of cataloging rules to the computer has occupied librarians throughout the world. Within a relatively few years the card catalog as we know it today will be replaced by a system which gives access to the wealth of a library through electronic means on an instrument much like a TV screen.

All has meant constant study by members of the library staff, attendance at workshops where the new technology is explained and demonstrated, study and consideration of new innovations, all with a view to faster and more complete library service.
STUDENTS

The 1978-79 academic year marked a record Clemson enrollment, with a total of 11,478 registered for classes—9,265 full-time and 1,206 part-time students on campus and the remaining 1,007 in various off-campus programs. Of the total enrollment 2,553 were graduate students. In the past 10 years total enrollment has jumped 68 percent.

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.

The College of Engineering was again number one in enrollment in 1978-79 with 2,181 students. The College of Industrial Management and Textile Science ran a close second with 2,029 students enrolled, and was followed in order by Education, Sciences, Agricultural Sciences, Liberal Arts, Forest and Recreation Resources, Nursing, and Architecture. Engineering had the largest percentage increase with 15.5 percent while Industrial Management and Textile Science grew 9 percent. All other colleges experienced some decrease in enrollment.

Opportunities for higher education continued to become increasingly accessible as evidenced by the increased number of freshmen entering college with advanced standing. In the 1978-79 fall semester, 797 new high school graduates entered Clemson with advanced standing by means of College Board Advanced Placement courses (330), concurrent enrollment in high school and college (245), enrollment in summer school (Clemson 90, other institutions 97), and departmental examinations (35). This total is almost double the 400 new freshmen who entered with advanced standing in 1977-78.

At Clemson, performance in high school has proven to be the best single predictor of success in the freshman year. The class ranks of entering freshmen have improved to the point that 40 percent of the freshman class entering in the fall of 1978 ranked in the top 10 percent of their class; 64 percent in the top 20 percent; and, 95 percent in the top 50 percent. Much publicity has been given to the decline nationally 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 1978 the freshman class average of 1,000 compared with an average of 897 reported by College
Board for all high school seniors. It is also the highest average among state-supported institutions in South Carolina.

Of the 5,443 new applications for admission for 1978-79, 3,779 were accepted and 2,536 actually enrolled (including freshmen and transfer students). South Carolina residents accounted for 79 percent of the 11,478 students, including those enrolled in off-campus programs. Clemson students come from all 46 South Carolina counties, 43 states, Puerto Rico, the District of Columbia, and 40 foreign countries (137 students).

Fall semester enrollment comparisons for recent years are shown below:

### Fall Semester Enrollment Comparisons

<table>
<thead>
<tr>
<th>Year</th>
<th>Graduate</th>
<th>Undergraduate and Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
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<td>6,203</td>
<td>818</td>
<td>7,021</td>
</tr>
<tr>
<td>1970-71</td>
<td>6,679</td>
<td>1,359</td>
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<td>1971-72</td>
<td>7,300</td>
<td>1,590</td>
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<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>
</tbody>
</table>

The 1978-79 figures include 856 students attending off-campus institutes and 151 in the Clemson-Furman University Master of Business Administration degree program.

Enrollment of women at Clemson reached an all-time high during the 1978 fall semester. There were 4,660 of which 3,387 were undergraduates on the campus. Enrollment of undergraduate coeds increased about 3 percent over last year. Women students now constitute more than 38 percent on-campus enrollment and about 41 percent of total enrollment.

The Clemson student body continues to be a working group who receives a significant amount of financial assistance in the form of loans, grants, scholarships and work assistance. In 1978-79 approximately 3,250 students earned an estimated $3,043,849 working for the University. (This figure does not include earnings from off-campus employment.) Clemson awarded 276 long-term loans totalling $212,175. The University also approved and certified 676
guaranteed student loans from a variety of lending institutions. Excluding donor-selected scholarships, 1,600 scholarships and grants, valued at $1,589,850 were awarded. The Middle Income Student Assistance Act signed into law by President Carter on November 1, 1978, significantly increases student financial aid benefits to middle income students. The number of students receiving Basic Grants is expected to at least double with the average awards increasing. Other federal programs are significantly affected as well. In all, it is estimated that 40-50 percent of the student body received financial assistance administered by Clemson.

Career Services, which is composed of Placement and Cooperative Education, provided career information and guidance for many students and alumni. The Placement Office coordinated 488 company/government agency campus visits, a 61 percent increase over last year. Most recruiters wanted to talk to students who majored in engineering, business, computer science, or textiles, but all graduating seniors were encouraged to talk to industry representatives about career opportunities.

Clemson’s Cooperative Education Program, begun in 1973, continued to grow, placing some 250 students in over 400 career/academically-related work assignments with industry and governmental agencies. Co-op students earned over $600,000 dollars during 1978-1979, bringing the cumulative Co-op earnings of Clemson students to well over $2 million since 1973.

Student organizations on the Clemson campus number well over 200. These organizations have a well-balanced program of extracurricular activities and contribute to the total educational experience of students.

Student Government had an important role in the screening process during the search for a new president. The Student Body president and the Student Senate president represented the student body on this committee. Student Government was instrumental in establishing a campus ambulance service manned by student volunteers, each of whom must be a certified EMT. EMT training is financed by the Department of Services, a branch of Student Government.

Student media organizations have had a successful year. WSBF celebrated its twentieth anniversary by becoming Clemson’s first and only stereo FM radio station, *The Tiger* was named an all-American newspaper for the fall semester by the Associated Collegiate Press, while *TAPS* was named best overall yearbook in
Tiger Brotherhood celebrated its fiftieth anniversary and announced a long-term project to develop a park along Highway 93. The main purpose of this park is to retain the beautiful atmosphere of the entrance to the University.

Sororities continue to grow and include in their membership approximately 19 percent of the undergraduate women. Scholastic excellence is stressed, and the grade-point average for all sorority women for spring semester 1978-79 was 2.89.

The fraternity system continues to be composed of 14 chapters of national college fraternities, comprising approximately 15 percent of all undergraduate males. Housing limitations both on and off campus prevent expansion in the number of chapters. The grade-point average for all fraternity men is above the average for all undergraduate men.

Parking and traffic records are maintained to coincide with the academic calendar or from August 15 to August 15. During the period August 15, 1978, through May 11, 1979, 9,436 student parking decals were issued. Of this number, 8,443 were issued in the fall semester and $6,034 was deposited to the Miscellaneous Income Account (MIA). The Campus Security Office wrote 27,295 student parking tickets during the same period. The total amount collected at the traffic office or turned over to the accounting office for collections amounted to $81,335 and was deposited to the MIA. The Student Traffic Review Board functioned for the second full year and heard appeals for 1,458 students involving 1,785 parking tickets, or about 6 percent of the tickets written.

In the area of returned checks, 1,332 student checks were returned to the Student Affairs and Traffic Office. In the form of administrative handling charges, $1,498 was deposited to the MIA. Approximately 85.8 percent of $90,411.22 was collected by the Student Affairs and Traffic Office.

The Edgar A. Brown University Union, working through 11 student committees and 200 student volunteers, provided 700 different programs for Clemson students in the 1978-79 school year. Programs were designed to serve the social, cultural and recreation needs and interests of students, faculty and staff. Programs consisted of concerts, game tournaments, short courses, cultural theatre, travel, films and videotape, special programs and outdoor
events. In addition, the Union facilities were used in unscheduled activities by many thousands of students, faculty and staff.

In the athletic arena, the outstanding achievements of Clemson's overall sports program gave students plenty to cheer about, as it recorded its finest year in the school's history.

The 1978-79 season was highlighted by five Atlantic Coast Conference team championships. The Tigers swept through the fall sports scene in ACC competition by earning league titles in football, soccer and cross-country, and captured their first ever Men's Fencing Crown and garnered another in a long line of league baseball titles.

Clemson proudly boasts a well-rounded athletic program which includes 12 men's and 7 women's varsity teams, giving the Tigers 19 varsity intercollegiate contingents. In overall competition during the 1978-1979 season, the Tigers and Lady Tigers managed 209 total victories compared to only 85 losses and five ties, giving Clemson an overall combined winning percentage of better than 70 percent. There was but one team of the 19 sports which failed to reach the 500 level in wins and losses.

No other year in Clemson athletic history, in the two major revenue-producing sports of football and men's basketball, can claim the combined two-sport successes which came to our Tigers during 1978-79. Season ticket sales exceeded all previous marks for both sports, and record attendance was recorded in both Memorial Stadium and Littlejohn Coliseum as these two Tiger teams brought the University much national recognition. The football team's 11-1 overall record, which included Clemson's tenth post-season bowl appearance (Gator Bowl), earned Clemson a final ranking of fifth in the national wire service poll. And the basketball team made only its second post-season appearance ever and brought the University what very well could be termed as the most exciting moment in Clemson Tiger Basketball history as Bill Foster's Cagers defeated defending national champion Kentucky in first round NIT action at the Wildcat's own Rupp arena.

In each of the last four seasons, an independent survey by a Knoxville, Tenn., sports writer has listed Clemson among the nation's top 25 NCAA Division One Universities for overall sports excellence. The 1978-79 athletic year should be no exception as the performance by all 19 Tiger and Lady Tiger teams will go down as one of the most exciting and productive seasons in Atlantic Coast Conference sports history.
### Fall Semester 1978 Enrollment by Colleges, and Degrees Awarded
#### December 1977 - August 1978

<table>
<thead>
<tr>
<th>Main Campus</th>
<th>Enrollment</th>
<th>Degrees</th>
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<tbody>
<tr>
<td>Fall Semester</td>
<td>Associate</td>
<td>Bachelor's</td>
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<tr>
<td>Agricultural Sciences</td>
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<td>Architecture</td>
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<tr>
<td>Education</td>
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<tr>
<td>Engineering</td>
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<tr>
<td>Forest &amp; Rec. Resources</td>
<td>616</td>
<td>0</td>
</tr>
<tr>
<td>Ind. Mgt. &amp; Text. Science</td>
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<td>0</td>
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<tr>
<td>Liberal Arts</td>
<td>878</td>
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<tr>
<td>Nursing</td>
<td>482</td>
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<tr>
<td>Sciences</td>
<td>1,243</td>
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<tr>
<td>Non-degree</td>
<td>64</td>
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</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>10,471</strong></td>
<td><strong>41</strong></td>
</tr>
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</table>

Degrees awarded since 1896 (through August 1978) total 39,832 of which 314 have been associate degrees; 32,913 bachelor's degrees; 6,052 master's degrees; 51 education specialist degrees; and 502 doctorates.
### Acceptance Rate of Applicants

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<td>1974</td>
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<td>1975</td>
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</tr>
<tr>
<td>1977</td>
<td>69%</td>
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<tr>
<td>1978</td>
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### Retention Rate of Students
(Freshman Class)

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<tr>
<td>1969</td>
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<tr>
<td>1970</td>
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<tr>
<td>1976</td>
<td>83%</td>
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<tr>
<td>1977</td>
<td>84%</td>
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### Number and Percent of Black Students

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<thead>
<tr>
<th>Year</th>
<th>Number</th>
<th>Percent</th>
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<tr>
<td>1972</td>
<td>179</td>
<td>2</td>
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<td>1973</td>
<td>211</td>
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<td>Year</td>
<td>Ratio</td>
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<td>------</td>
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<tr>
<td>1969</td>
<td>12.6 : 1</td>
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<td>1975</td>
<td>18.3 : 1</td>
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<td>1978</td>
<td>15.9 : 1</td>
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<table>
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<th>Year</th>
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<table>
<thead>
<tr>
<th>Year</th>
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<td>1971</td>
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<td>1976</td>
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<tr>
<td>1977</td>
<td>654.4</td>
</tr>
<tr>
<td>1978</td>
<td>675.6</td>
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### Number in Freshman Class

(New Students)

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<th>Year</th>
<th>Number</th>
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<td>1,468</td>
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<td>1976</td>
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<tr>
<td>1977</td>
<td>1,838</td>
</tr>
<tr>
<td>1978</td>
<td>2,020</td>
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### Number of On-Campus Students in Summer School

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<td>4,692</td>
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<tr>
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<td>5,232</td>
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<td>1973</td>
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<td>5,997</td>
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<tr>
<td>1975</td>
<td>6,275</td>
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<tr>
<td>1976</td>
<td>6,100</td>
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<tr>
<td>1977</td>
<td>6,301</td>
</tr>
<tr>
<td>1978</td>
<td>6,396</td>
</tr>
<tr>
<td>Year</td>
<td>Beds</td>
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<tr>
<td>------</td>
<td>--------</td>
</tr>
<tr>
<td>1960</td>
<td>2,900</td>
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<td>1973</td>
<td>5,330</td>
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<td>5,592&lt;sup&gt;a&lt;/sup&gt;</td>
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<td>1975</td>
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<tr>
<td>1977</td>
<td>5,625&lt;sup&gt;c&lt;/sup&gt;</td>
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<td>1977</td>
<td>5,662&lt;sup&gt;d&lt;/sup&gt;</td>
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<td>1978</td>
<td>5,933&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>1979</td>
<td>6,056&lt;sup&gt;f&lt;/sup&gt;</td>
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<sup>a</sup> Includes 252 beds in the Clemson House.
<sup>b</sup> Includes 262 beds in the Clemson House.
<sup>c</sup> Includes 271 beds in the Clemson House.
<sup>d</sup> Includes 308 beds in the Clemson House.
<sup>e</sup> Includes 312 beds in the Clemson House.
<sup>f</sup> Includes 324 beds in the Clemson House.
<sup>•</sup> Includes 366 beds in the Clemson House.
<sup>0</sup> 366 beds are temporary housing.
## 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>$ 7,581,887</td>
<td>7.68%</td>
</tr>
<tr>
<td>State Appropriations:</td>
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<td></td>
</tr>
<tr>
<td>Educational &amp; General</td>
<td>$ 34,182,064</td>
<td>34.63%</td>
</tr>
<tr>
<td>Agricultural Research &amp; Public Service</td>
<td>$ 18,998,301</td>
<td>19.25%</td>
</tr>
<tr>
<td>Federal Appropriations:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational &amp; General (Morrill-Nelson)</td>
<td>$ 121,374</td>
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</tr>
<tr>
<td>Agricultural Research &amp; Public Service</td>
<td>$ 8,823,940</td>
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</tr>
<tr>
<td>Sales &amp; Services of Educational Departments</td>
<td>$ 3,313,518</td>
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</tr>
<tr>
<td>Endowment Income</td>
<td>$ 111,162</td>
<td>0.11%</td>
</tr>
<tr>
<td>Sales &amp; Services of Auxiliary Enterprises</td>
<td>$ 15,655,512</td>
<td>15.86%</td>
</tr>
<tr>
<td>Federal Grants &amp; Contracts</td>
<td>$ 4,128,148</td>
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<tr>
<td>State Grants &amp; Contracts</td>
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<td>Local Grants &amp; Contracts</td>
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<tr>
<td>Private Gifts, Grants, &amp; Contracts</td>
<td>$ 2,998,586</td>
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</tr>
<tr>
<td><strong>TOTAL REVENUES &amp; ADDITIONS</strong></td>
<td>$ 98,709,266</td>
<td>100.00%</td>
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</table>

Brought forward from 1977-78 for:
- Encumbrances and Restricted Funds Balance: $ 3,392,530

**TOTAL FUNDS AVAILABLE**: $102,101,796

### Expenditures by Function

<table>
<thead>
<tr>
<th>Function</th>
<th>Amount</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction</td>
<td>$ 22,769,797</td>
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<tr>
<td>Research—Departmental</td>
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<td>5.60%</td>
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<tr>
<td>Research—Agricultural Experiment Station</td>
<td>$ 11,334,634</td>
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<td>Extension &amp; Public Service</td>
<td>$ 3,322,177</td>
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<td>Extension &amp; Public Service—Cooperative</td>
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<td>Agricultural Extension Service</td>
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<td>Academic Support</td>
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<td>Student Services</td>
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<td>Institutional Support</td>
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<td>Auxiliary Enterprises</td>
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<td>Scholarships &amp; Fellowships</td>
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<td><strong>TOTAL EXPENDITURES</strong></td>
<td>$ 94,065,976</td>
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Transfers and Other Deductions: $ 4,864,190

**TOTAL EXPENDITURES, TRANSFERS AND OTHER DEDUCTIONS**: $ 98,930,166

Balance 6/30/79 for Encumbrances and Restricted Funds Balance: $ 3,171,630

**TOTAL EXPENDITURES & BALANCE**: $102,101,796
## Scholarship and Student Aid and Loan Funds
### Fiscal Year 1978-79

#### Revenue

<table>
<thead>
<tr>
<th>Source</th>
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<tbody>
<tr>
<td>Interest on Loans</td>
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<tr>
<td>Gifts, Grants &amp; Contracts</td>
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<td>Endowment Income</td>
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<tr>
<td>Investment Income</td>
<td>$322,567.95</td>
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<tr>
<td>Other Income</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$2,798,637.13</strong></td>
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#### Disbursements

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>Educational Loans</td>
<td>$235,973.37</td>
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<tr>
<td>Grants for Scholarships &amp; Fellowships (Including Grants-in-Aid)</td>
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</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$1,507,797.44</strong></td>
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</table>
The College of Agricultural Sciences administers statewide public service programs in addition to its program 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

The South Carolina Agricultural Experiment Station conducts the only program of agricultural research funded by the State. The Station, administered from Clemson University's College of Agricultural Sciences, has branches in four other parts of South Carolina.

Scientists working out of 10 departments in the college carry on the research program of the Station. In addition, home economists at Winthrop College are responsible for home economics research projects.

Branches of the Experiment Station are the Sandhill Station at Pontiac near Columbia, the Pee Dee Station at Florence, the Edisto Station at Blackville and the Coastal Station at Charleston. Each responds to the particular agricultural interests, soils and climate of its section of the State, developing a research program which addresses the needs of the area it serves.

The Experiment Station was established in 1886 under federal laws. It operates under state control with annual appropriations from the South Carolina Legislature which are supplemented by federal appropriations.

There is an experiment station in each of the 50 states. Cooperative and complementary research with these stations and other governmental agencies has been responsible for the development of a tremendous information pool for agriculture. The giant steps made in agricultural production and efficiency over the past 50 years will have to continue in order to meet the challenge of the future.
To meet this challenge, S. C. Experiment Station researchers join forces with fellow scientists in other states seeking to help provide better lives for Americans as well as for peoples in other parts of the world. Using natural and human resources to their best advantage is the goal of Station scientists.

**Highlights and Accomplishments**

The following summary attempts to highlight both new and ongoing research activities of the S. C. Experiment Station. Many significant projects have not been mentioned. Instead, a few representative ones have been selected to offer some idea of the scope and variety of some 270 active projects conducted by Station scientists during the fiscal year from July 1, 1978, to June 30, 1979.

**Agricultural Economics and Rural Sociology**

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

Cost and returns for the grow-out phase of producing *Macrobrachium* (a prawn-like shell fish) were estimated this year for South Carolina. The data indicated a loss of $62 per acre pond in 1977 but a $312 profit in 1978. The difference can be attributed to better feed conversion and more of the larger size prawns in 1978. *Macrobrachium* is potentially an important supplementary crop for coastal plains farmers.

An analysis of large packaging haying systems in South Carolina indicates that this method is an economically feasible means of putting up a large volume of hay. When the hay is fed on the farm, barriers to regulate access usually save more than they cost.

Research by agricultural economists revealed that tomatoes may not be the crop for limited resource farmers. Such farmers are not equipped to accept high risks associated with producing greenhouse seedlings or field grown tomatoes. Although cooperative marketing of fresh tomatoes can be very profitable, it requires good management and member participation. Tomatoes produced in Georgia and Florida provide stiff competition for South Carolina.

Research indicates that livestock markets are very responsive. When new information concerning the expected supply conditions of hogs is released, it requires only one day before it is reflected in hog contracts three to four months from delivery. Research in the beef subsector also indicates a relatively rapid adjustment at the retail, wholesale and farm levels.
Studies of educational aspirations of rural youth in South Carolina show teaching to be the most popular professional career option among black high school seniors. Teaching satisfies status ambition and is often seen as a transitional stage on a ladder of intergenerational mobility. Sophomore students in high schools that obtained racial balance in a radical way reported much lower educational aspirations than students in schools changing their racial balance in a more orderly fashion.

New industries do not locate in a footloose manner. High water-using plants tend to concentrate in certain areas more than low water-using plants. However, research indicated that industrial location is spreading to most parts of South Carolina. Procedures for estimating input-output matrices from published national matrices and employment data from secondary sources have been developed. Thus, estimates of interindustry relationships and dependencies can be estimated for South Carolina at a small fraction of the cost of other state input-output models.

The transition from almost total state dependency of local governments to home rule creates local finance problems. Agricultural economists have played a lead role in providing Special Legislative Study Committee information on alternative sources of revenue to finance local governments. Alternatives such as local sales taxes, piggy-back income taxes, business taxes, accommodation taxes, revenue sharing, and others were compared for revenue yield and other results.

**Agricultural Engineering**

Agricultural engineers gave major attention to energy and computers during the past year. Studies included a hard look at both conservation of energy and utilization of alternative energy sources. Computer applications to such diverse areas as crop modeling, irrigation scheduling, data acquisition and management decision making are ongoing concerns of Station engineers.

A new project, directed toward making the most efficient use of energy during tillage operations, was initiated. Engineers are measuring energy inputs to tillage implements with a microcomputer-based instrumentation system and determining effects of different tillage treatments on energy requirements and crop growth and yield.

Another new project is the study of comparative water and energy requirements for controlled and reversible drainage (sub-
surface irrigation) systems and centerpivot sprinkler irrigation systems. Engineers think that costs and energy requirements for irrigation can be reduced substantially where conditions permit the use of subsurface systems.

Specific plans were developed for a prototype solar supplemented heat pump air heating unit to be tested as a grain dryer and to supply other farmstead energy demands. Fabrication is under way using a three ton capacity heat pump and 440 square feet of solar collector.

Modern electronics technology is rapidly improving the accessibility and usefulness of computers. Small personal computers, now available for a few hundred dollars, offer great promise for on-the-farm calculations of all types. Researchers have begun to develop programs that can be used in machinery and other resource management, short-term and long-term decision making, economics, and many other aspects of personal and corporate agribusiness life.

A computer-controlled data acquisition system was developed and installed in an earth-insulated solar house, one of two research and demonstration solar houses constructed last year at Clemson. The energy efficiency of this new type of construction will be monitored for at least two years.

Interest in irrigation is growing by leaps and bounds in South Carolina. Management techniques for irrigation under sporadic rainfall conditions are not well established. Researchers are developing methods to combine forecast and historical weather data with crop data using microcomputer techniques to give the day-by-day status of the soil's water content and determine when irrigation will be needed.

Two new studies related to on-farm processing and storage of agricultural products have begun. One project investigates the potential for natural air drying of grain in South Carolina. The other will determine the effect of environmental conditions on the viability of soybean seed during storage.

A promising new clover seeding system that is used in conjunction with a pasture renovator has been developed and tested. Engineers have established successful stands of clover in existing fescue pastures with the low cost seeder. The system is flexible in design and can be adapted to small farmers with low-horsepower tractors or to larger farming operations.

Hydrologic studies on the Clemson Research Watershed have been expanded to include sampling for pollution. Results show that
baseline pollution under natural forested conditions with minimum man-made activities is very low at normal flow and increases only slightly under high-flow conditions.

A study to more clearly define the processed yield, quality and additional sorting requirements of mechanically harvested and handled peaches is being conducted cooperatively with a commercial food processor. The mechanized system will be evaluated by running the fruit through the processor's production line.

Design and construction of a 48-foot vessel for testing a mechanical oyster harvester has been completed. Evaluation of the harvester and its environmental impact should begin this fall.

Agronomy and Soils

Agronomists are concerned with practical and new ways growers can increase farm profits from crops through efficient management practices.

Each year research and demonstrations are conducted in the major production areas in order to collect data for advising growers on crop varieties that should be grown, fertilizer and chemicals that should be used, and herbicides that will control weeds.

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

Effort has been accelerated toward release of barley varieties that are resistant to the prevalent diseases in the Southeast that attack and reduce barley yields. Breeding for replacement varieties for wheat that are resistant to the powdery mildew is under way.

Plant breeders have made progress in developing a late planted soybean. They expect that a suitable variety for late planting will be available to South Carolina growers within the next two years. 'Govan', a root knot resistant soybean variety released in 1978 by the South Carolina Experiment Station and USDA, is now available for grower use.

Cotton germ plasm with high yield and quality potential is being released continuously for improvement of cotton varieties available to growers. Similarly, corn breeding lines are being developed that have good resistance and/or tolerance to diseases and insects.
Corn hybrids are tested each year for performance under South Carolina conditions.

Sulfur and micronutrient status of South Carolina soils is being monitored for availability for use in crop production. The statewide sulfur soil fertility program indicates that a significant part of the sulfur needs for crop production is obtained from the atmosphere. Response of crops to manganese was shown to be related to soil pH. For example, no response to Mn was noted on soils with a pH of 5.9, but an application rate of about 10 pounds/acre of manganese produced maximum yields of soybeans where soil pH was 6.4.

Research shows that in-row subsoiling increases root growth and yields of soybeans and corn under non-irrigated conditions where soil profile conditions favor hard pans. Under irrigated conditions, no yield increase was obtained for soybeans by in-row subsoiling.

Commercial soybean inoculants have been evaluated for effectiveness by studies in South Carolina, Georgia and Alabama. Results showed a wide range in effectiveness of inoculants offered for sale. Nodulation of soybeans ranged from none to abundant. Test procedures demonstrated that non-peat base products and combination products containing molybdenum and/or fungicide were inferior to peat-base inoculants for viable rhizobia and nodulation of soybeans.

A study is under way to determine relationships between nematode infection in roots and effective inoculation of soybeans by nitrogen fixing organisms.

Researchers are trying to determine the economic value of retaining or discarding in the field the three to four bottom leaves of flue cured tobacco before harvest. Preliminary information indicates that leaves pulled and discarded just prior to topping gives the best yield and quality for commercially grown tobacco. Other research in tobacco includes development of weed control practices and appropriate time and rate of application for sucker control.

Animal Science

Animal scientists work toward the goal of producing high quality animals in the most economical and efficient ways.

They have shown again this year in nutrition studies that feeding Angus crossbred females high quality forage during the breeding season greatly increases rebreeding efficiency of young cows that have calved the first time. An increase over all breeds of 19
percent in conception rates indicates that clover-fescue pastures are superior to fescue alone.

Animal scientists have experimented with the feeding of corrugated boxes to animals in recent years and continue to tabulate results from the various tests. Over a 224-day period, they found the average daily gain for steers receiving 0, 5, 15, 25 and 35 percent corrugated boxes in their rations were 2.58, 2.55, 2.49, 2.44 and 2.36 pounds. Acceptability of beef was not affected by the addition of the boxes—or of Rumensin—to the diet. Pelleted boxes with Pro-Lix added was a satisfactory roughage for wintering heifers and pregnant cows.

Systems emphasizing year-round grazing and minimum energy input for growing calves from weaning to slaughter are being studied. During the first year of research, one of the systems produced 755 pounds of beef per acre without grain supplementation.

Four grazing systems were evaluated for growing out replacement beef heifers. Primary grazing consisted of tall fescue alone, fescue with white clover, orchardgrass alone, and orchardgrass with white clover. A three-year average daily gain for all systems was .97 per pound, with no significant differences among systems.

Station researchers have studied swine nutrition at several stages in the animal's development. They found that adding six percent corn oil to the diets of pigs three to eight weeks of age improved gains by eight percent and reduced the amount of feed required per pound of gain by 16 percent over conventional feeds.

Gilts and sows were fed levels of calcium and phosphorus at approximately 1.5 times that of National Research Council standards. The results indicated more reproductive efficiency for the first litter but only slight improvement for the second litter.

The double-decking system for raising nursery pigs was found economical when compared to the conventional nursery for the production of early weaned pigs.

In the area of pork products, researchers found the most desirable pumped ham was produced with a curing solution of .05 percent nitrite and .5 percent potassium sorbate.

**Dairy Science**

Dairy scientists at Clemson are involved in wide ranging research in both production and processing.

The future of a dairy herd depends on rearing healthy calves with good genetic potential. The first month of life is most critical in the life of a newborn calf. During this time milk replacers are
the major source of nutrients for the calf. A study with 54 Holstein heifers has shown that dry matter concentration of replacer was of greater importance in control of neonatal diarrhea than was fluid intake. In calves fed once a day, it was recommended that liquid diets should range from 10 to 15 percent dry matter. Overfeeding of dry matter can increase digestive upset in young calves.

Facilities for dairy lot flushing and separation of solids from the flush water are being installed throughout the U. S. Utilization of dairy waste solids as "bedding" for lactating dairy animals has been investigated. Survival rates of potentially disease-producing bacteria present in dairy waste solids were measured. Major reductions in bacterial populations were observed during composting, beginning after four days. After 12 days, all bacterial types had decreased significantly. Composted waste solids were then used for bedding. Evaluations are under way to determine if the bacteria still present in the waste solids will contribute significantly to the development of mastitis in these animals. Early results seem to indicate no difference in the incidence of mastitis between cows bedded on waste solids or the control (rubber mats).

A machine has been installed for packaging milk in paper containers that is different from other machines in that ultrasonic vibrations are used to generate heat for sealing packages. Heat used for sealing cartons is dissipated in the milk packaged in small cartons. Ultrasonic sealing should decrease the heat required for sealing cartons thereby increasing shelf-life of milk. Studies also include packaging milk in small plastic pouches. The quality of milk so packaged will be compared to the quality of milk in conventional packages.

Bacterial growth in raw milk and recontamination and resulting growth in the pasteurized product significantly affect shelf-life of the pasteurized product. The industry needs more rapid procedures for predicting the shelf-life of its pasteurized milk. Microbiological determinations of psychrotrophic (cold enduring) bacteria, pyruvate content (growth by-product of bacteria), and organoleptic evaluation of flavor are being made. Flavor still appears to be the best measurement of quality; however, it cannot be used in a predictive sense. Raw milk two days old does not appear to affect the shelf-life of the finished product. However, raw milk held four and six days prior to pasteurization does appear to lower the expected shelf-life of the processed product.
Although cultured products in general enjoy fairly universal acceptance, buttermilk, one of the most nutritious cultured products, has suffered declining sales in recent years. Masking the acid taste of cultured buttermilk with fruit flavorings (similar to fruit-flavored yogurts) could result in significantly increased sales of buttermilk. Fruit flavored cultured buttermilk products were prepared and evaluated for consumer acceptability and shelf-life. Data indicated that even among consumers who didn’t normally drink buttermilk there was very good acceptance for peach, blueberry and raspberry flavored cultured buttermilk.

Laboratory techniques have been established to study the causes of early embryonic death in cattle. Fertilized eggs can be grown in the laboratory to a stage equivalent to about 10 days in the living animals. Also endometrial tissue culture (cells from the lining of the uterus) techniques have been established.

Entomology and Economic Zoology

Entomologists seek new management techniques for controlling insect pests which cause economic losses to farmers and health hazards to humans. Wildlife and fisheries biologists study methods for better producing or protecting animal wildlife or aquatic life with economic importance or potential importance to South Carolinians.

The red imported fire ant was accidentally introduced into the Mobile, Alabama, area in the mid-1930’s. Since that time the ant, like many other biological organisms when introduced into a new environment void of its natural enemies, has infested large areas of land including much of South Carolina. Its aggressive stinging habits when its mound is disturbed make this ant a major nuisance.

In the past, much research has been directed toward eradication and other large-scale control programs for the fire ant; however, many of the chemicals used in these programs have been eliminated through regulation. As a result, control of the ant in high human-use areas and around the home has become a serious problem. Current research by Station entomologists centers on the development of control procedures for homeowners, certain aspects of biological control and several facets of the insect’s biology to include how food is transferred within the colony, colony relationships, queen success and the role of the ant as a predator.

Research is being conducted on beneficial and pest insects and related arthropods associated with peaches. Total kills of all arthro-
pods on individual trees in an orchard are made at biweekly intervals throughout the season. The population dynamics of the species collected are composed between sections of the orchard under standard grower management practices and sections receiving only fungicide sprays. Simultaneous evaluation of insect damage to the fruit is made. Periodic samples are also taken at an unsprayed block of trees at the Sandhill Experiment Station to compare the fauna associated with peaches in the lower part of the peach producing area with the Piedmont region.

Population trends of peachtree borers and lesser peachtree borers are being monitored with sex pheromone traps in the major peach producing regions of the State.

Insecticides currently labeled and those under development are being evaluated. Rates and application time are varied to achieve optimal insect control and minimal environmental disturbance.

In a new project, Clemson's freshwater fishery biologist is examining the effects of reduction in soil erosion on fish populations in Piedmont streams. In addition, environmental factors such as meandering and frequency of pools and riffles are being related to abundance and diversity of fish populations. Ongoing foodfish research is considering culture of channel catfish, tilapia and silver carp. Maximum production in fish culture is seldom realized because there exists unutilized food sources in a pond. Such sources can be tapped without reducing production of the southeast's favorite freshwater foodfish, the channel catfish. In fact, culture of more than a single species (polyculture) cannot only provide more total production but improve water quality conditions necessary for good catfish growth.

Food Science

Food scientists are interested in nutrition—how people are affected by what they eat—and are also involved in the study of processing and packaging foods in ways to optimize their value to the consumer.

Obesity is a serious nutritional problem in the United States. One of the treatments for this condition is to surgically bypass part of the intestine. However, the operation is frequently accompanied by many side affects, and the short-term and long-term effects on the nutritional status of the patient are not well known.

Clemson scientists performed similar operations on laboratory rats in order to study these effects. Surgically modified rats suffered
diarrhea for about 30 days following the operation and then began to recover, as is usually the case with humans. Body weight was reduced about 20-25 percent. Other changes observed included large amounts of fats in the feces, increased copper in the urine and decrease in liver weight. (The fatty liver condition observed in humans was not apparent in the rat subjects.) Nine months after the surgery—corresponding to some 20 years in humans—some of the rats showed signs of a deteriorating condition and loss of ability to adapt to the stress of the shortened intestine.

Food scientists have evaluated numerous bacterial cultures used to prepare conventional fermented dairy products for use in “peanut milk” fermentation. Several cultures produce an agreeable, tangy flavor when added to a “peanut milk” which is prepared by grinding one part full-fat peanuts with nine parts water. After fermentation, the liquid thickens slightly and has an appearance similar to natural yogurt. The peanut yogurt product resulting has about the same amount of protein per serving as yogurt prepared for cow’s milk. Yogurts with a good, tangy flavor can be produced without added sugar, but for Swiss-style products, fresh fruit or fruit flavorings can be added to taste.

In studies recently completed by station food scientists, ethyl alcohol was fed to male and female rats for a period of six weeks prior to mating. The rate of conception was reduced when female rats consumed alcohol prior to mating. Increased numbers of stillbirths were observed in those litters in which either or both parents had consumed alcohol prior to mating. Significant reductions in the number of pups per litter and the total litter weight (sum of birth weights of all offspring in a litter) were observed in those litters in which one or both parents ingested ethanol. A greater number of mothers killed one or more of their offspring in these litters where ethanol was consumed by either or both parents.

No differences in early post-natal growth, brain size or brain composition (dry weight, fat, cholesterol, protein, DNA and RNA) were observed between 49-day-old offspring whose parents had ingested ethanol prior to mating. These results may be biased by the natural selection of only the “most fit” surviving pregnancy and the elimination by stillbirth or early infanticide of the less fit offspring.

The data suggest that indiscriminate alcohol consumption prior to mating by either the male or female parent may affect the course of subsequent pregnancy.
Researchers are investigating an improved method for thermally processing rehydratable foodstuffs in hermetically sealed containers to an edible consistency. The concept enables cooked foods to be retained without special handling procedures for extended periods of time.

The process involves incorporating a predetermined quantity of hydratable foodstuffs in a hermetically sealable container, such as a can, jar or retortable pouch, with the predetermined amount of liquid adequate to hydrate the foodstuff to an edible consistency, hermetically sealing the container, and thermally processing so the food possesses an edible consistence and is rendered commercially sterile. Since virtually all of the added fluid is absorbed by the food during thermal processing, substances soluble in the fluid may be included to likewise be absorbed by the food. In this fashion, the color, flavor or nutritive value of the food may be engineered to realize a particular benefit for the consumer. Foods so processed have excellent storage qualities, improved taste qualities and increased nutritive value. They save energy in processing and are easier to store and transport.

**Home Economics**

During 1978-79, research in home economics at Winthrop College was conducted in the areas of nutrition, textiles, home economics education, and in family/child development.

Work began on a new regional project titled "Career Projections and Attainment of Low-Income Youth: Changes Over Time." This project is significant in that it is a continuation of a longitudinal study begun in the 1960's. The subjects in the original project were then in the fifth and sixth grades. The goal of the first project was to determine what careers the youths wished to pursue and why. Now these subjects are out of high school and may be in college or may be employed. The goal of the present project is to determine to what extent they were able to attain their desired careers and, further, to isolate factors which may have changed their career aspirations.

A project was completed this year involving the day care centers for the aged in South Carolina. Through a series of questionnaires, on-site visits and a workshop, it was determined that personnel in these centers are in need of more information on education, recreation, cultural and leisure activities, and nutrition specifically for the elderly. Only by additional training can the centers provide
the best service to the aged. Those who attended the workshop reacted positively toward the workshop and most requested additional workshops.

In order to achieve consistency among the cooperating states, much recoding of data was done on the regional project "Patterns of Food Intake and Nutritional Health of Girls." The committees of investigators are now able to work on a series of research bulletins covering various aspects of the project.

A bulletin has been prepared for publication on the regional project, "Defining and Achieving Life Goals: A Process of Human Resource Development." This bulletin presents a profile of the background characteristics, experiences, goals and attitudes of agricultural and home economics college students in South Carolina.

In textiles, some results are becoming available in the project investigating the various factors affecting wearer comfort in athletic apparel. The data indicate that insulating capacity is more dependent upon fabric thickness than upon fiber content. Further research is needed using moving rather than still air and also the effect of multiple layers on the insulation value.

The investigation of the effects of laundry temperature, agitation speed and detergent phosphate level on flame retardancy has been complete. Cotton flame retardant (FR) fabric is adversely affected by increases in agitation speed and water temperature, with significant effects resulting from increasing temperature when using low phosphate detergent. The polyester FR fabric, however, showed no significant changes in flame retardancy from any combination of temperature, agitation speed or phosphate level.

Horticulture

Horticulturists conduct research with vegetables, fruits, ornamentals, turfgrasses and post-harvest handling.

Through grant support provided by Manpower and the Comprehensive Employment Training Act (CETA), 45 handicapped, emotionally disturbed, and/or under-employed individuals were placed on the job at the Clemson Horticultural Gardens during the year. Research was conducted on the utilization of a greenhouse for the handicapped. Fifteen of the workers involved in the study had emotional disturbances and other disabilities. All phases of greenhouse production and maintenance were dealt with, and approximately 80 percent of the clients were placed in jobs after leaving the program.
A two-year study of humate (a natural material somewhere between peat and coal) and other organic materials using container-grown pineapples was completed. Flower induction with an ethylene compound resulted in uniform flowering and fruiting. Preliminary evaluations of data using parameters of soil and foliar analyses, fruit and plant weight, as well as quality determinations of fruit indicate favorable results with several humate application rates as compared to the control and commercially prepared humate-containing organic materials.

Development of a new 40-acre fruit research area near the campus is continuing. The peach variety block has been expanded, and progeny from peach crosses have been set out for evaluation. Plantings of apples for cultivar, rootstock and cultural practice evaluation have been made. A peach planting for mechanical pruning and harvesting studies in cooperation with the Agricultural Engineering Department has been established. An irrigation system for the area is being developed.

Pollination of 'Delicious' apples is being studied. Pollen was collected from several apple and crabapple cultivars, and controlled pollinations were made on two strains of 'Delicious'. Fruit set counts and fruit growth measurements are being made and indicate suitability of several cultivars as pollenizers.

Apple production for both fresh and processed markets has shown continued growth in recent years in the State and region. Post-harvest studies were initiated in 1978 to study factors affecting apple quality relative to short-term cold storage potential. Additional tests will determine the best handling and storage procedures for apples to be processed as sauce or juice.

A vegetable trial garden has been established at Simpson Experiment Station near Clemson. The purpose of this new facility is to serve the needs of our ever-increasing urban population in South Carolina. Vegetable breeders emphasize the development of varieties and cultural practices that are useful to the home vegetable gardener. As improved varieties and practices come along, they are demonstrated in the trial garden through organized tours complete with instruction. Over 700 gardeners attended the home garden tour in June 1979 and received instruction from 11 members of Clemson's professional staff. In this facility, the garden becomes the classroom.

A new primary turfgrass research area is located in the Horticultural Gardens on the Clemson University campus. Work began on
the present three-acre site in the spring of 1978. The new facility will include 10,000-sq.-ft. bentgrass and 15,000-sq.-ft. bermudagrass putting greens, completely automatic irrigation system, and a 2400-sq.-ft. service center. The three-phase implementation plan is well on the way to completion. The first phase of site leveling, installing the irrigation system and construction of the service center has been completed. The second phase, construction of the experimental greens, is 50 percent completed. The third phase, establishment of warm season and cool season turf grasses, will be accomplished in 1980.

Research studies are being conducted at the Sandhill Experiment Station on cultural management of centipedegrass, a major lawn grass in central and eastern South Carolina. The studies include fertilization, thatch control, soil aeration, and weed control.

A solar heated greenhouse/residence combination has been constructed at Clemson University in which the horticulturists have evaluated food production potential. As such greenhouses operate at low and variable temperature, careful selection of crops is required, and a high management level is required. There are major insect problems during spring and early fall. Economic evaluation of prototypes appear questionable unless crops can be grown at even lower temperatures. Future research will focus on these areas.

**Plant Pathology and Physiology**

Plant disease research made significant progress in 1978-79. The overall program was designed to learn more about the biology of the disease organisms with an ultimate goal of instituting better pest management practices.

Two major benefits from spray schedules developed for peaches by Station plant pathologists were control of the benomyl-resistant, scab-causing organisms by alternate sprays and fewer applications needed for a full-season schedule. Strains of nonpathogenic bacteria antagonistic to the crown-gall organisms have been isolated and are being tested as biological controls of the crown-gall disease. This could be extremely valuable for treating fruit-tree rootstocks.

Spray schedules were developed for disease control on pecans, and progress was made toward formulating a prediction system for disease incidence so that the number of sprays used on pecans can be reduced. In another area, "fingerprinting" some of the chemical makeup of fruit trees, using rather sophisticated equipment, is
a Station-developed method for testing for trueness to variety, scion-rootstock compatibility, and pest resistance.

Cylindrocladium black root rot (CBR) of peanuts was found to be weather dependent, and chemical controls were not effective. Resistance, plus good cultural practices, reduced losses. Directed sprays and nematicides were tested for control of other peanut diseases, especially stem and pod rots.

One of the major production problems with summer and fall vegetables in the Piedmont region is insect transmission of virus diseases. Enough information was obtained to warrant petitioning for clearance to use stylet oil as a control. This method of applying mineral oil prevents insect transmission of viruses and will help growers profitably produce vegetable crops late in the season.

The number of nematodes it takes to cause damage to a given crop is a perplexing problem for growers and plant protection advisers. Valuable information was gained toward separating effects of several nematodes on soybeans, as well as identification of root-knot nematode species in South Carolina and the role of nematodes in peach tree short-life.

Corn viruses, especially maize dwarf mosaic virus, were found to cause significant yield losses. Biology of the major aflatoxin-causing organism is now better understood. Infection takes place in the field in August, and many kernels become infected before the end of the season.

In the area of ornamental plants, spray schedules were developed to control major diseases of roses and zinnias. Soaking camellia scions in fungicides helped reduce losses during grafting. Seed-grown dahlia and geraniums had fewer disease problems than those reproduced vegetatively.

Clemson's contribution to a southern regional clover project was directed toward identifying from plant tissue major viruses contributing to rapid clover decline. This ability to quickly and accurately separate clover viruses should enhance breeding for resistance and result in commercially acceptable clovers to better South Carolina pastures.

Diuron, an herbicide used for aquatic weed control, was found to be degraded to nonactive components by soil organisms. In other herbicide work, plants grown in culture were used to test potential herbicides and to study how the chemicals affect plants.
Poultry Science

The Poultry Science Department maintained a strong research effort aimed at providing basic information on the economically important avian species and providing solutions to current and anticipated problems of the poultry industry.

Nutrition research with broiler chicks included a study on the use of dehydrated forages as a source of protein. Many of the ingredients now used in poultry feed are acceptable for human consumption. As population pressures increase, other feedstuffs not suitable for human food will become more important. One potential material is clover. Preliminary results indicated that up to 7.5 percent of the diet can come from any one of three varieties of clover.

Additional investigations were completed on the cause and possible corrective measures for a condition known as Oily Bird Syndrome which involves an extremely oily skin on a freshly picked bird. Apparently some disturbance in fat metabolism occasionally causes broilers to develop the condition on a somewhat seasonal basis. Besides being difficult to handle and unpleasant to touch, these oily birds are inclined to develop “water pockets” during the chilling process while immersed in an ice and water slush. This excessive water pickup may cause the inspection service to require extra drainage time in the processing plant at great inconvenience and cost to the processor. Research just concluded suggests that the oily bird condition may be due, in part at least, to an amino acid imbalance in the diet of the growing broiler. Field observations suggest that temperature changes are related to the development of the condition. Research with environmental chambers, in which birds can be subjected to any number of temperature treatments, has failed to pinpoint the sequence of temperature changes which is involved in bringing on the condition. The oily or greasy bird is wholesome and indistinguishable from a normal bird when cooked, but it creates problems for the processor and may be less attractive to the shopper.

Branch Stations

The Sandhill Station at Pontiac is 14 miles northeast of Columbia and serves the Midlands section of the State as well as the fruit growers of the Piedmont and pecan growers statewide.

Emphasis here is on all phases of production and handling of peaches, nectarines, plums, grapes, blueberries, pecans and other
fruits and nuts. A limited vegetable research program is also conducted. The S. C. Swine Evaluation Center and Livestock-Poultry Health Division are both located on the Station property.

The Pee Dee Station at Florence, soon to be relocated on some 2,300 acres in Darlington and Florence counties and renamed the Pee Dee Research and Education Center for Agriculture, serves a 13-county area where tobacco, soybeans, corn, cotton and other agricultural crops are tremendously important to the economy.

The new center will be shared with members of the Clemson University Extension staff who serve the Pee Dee district of the State and with district regulatory officers. USDA researchers on cotton will be stationed at the new facility.

The Coastal Station, located at Charleston, emphasizes a systemized approach to commercial vegetable production in South Carolina. Typical of this approach are research projects that have resulted in the release of numerous resistant vegetable varieties, established procedures for managing tomato pests, and developed pesticide schedules for the grower.

The Station features an Urban Research and Demonstration Area offering the public an opportunity to browse through an arboretum and plots of ornamentals, vegetables, lawn grasses and a small orchard. The gardens have been very popular with tour groups and individuals from the Charleston area.

The Edisto Station at Blackville conducts research relevant to the cattlemen and growers of the upper coastal plans. Plant research and variety testing of soybeans, sunflowers, corn, grain sorghum, small grains, sweet potatoes, peanuts, cotton, watermelons and cantaloupes is done here.

In addition, work with insect management, irrigation and plant disease is extensive. The animal science program will be extended significantly with the transfer of cattle from the phased-out Coast Station at Summerville.
Active Research Projects, 1978-1979

Agricultural Economics and Rural Sociology

Implications of alternative federal energy policies on South Carolina economy, with emphasis on agriculture.
Local factors affecting industrial plant location in rural communities of the South Carolina Coastal Plains.
Marketing performance of selected milk pricing systems for the Southern Region.
The economics of peach production in South Carolina.
Public investment alternatives to meet projected manpower needs in South Carolina.
Efficiency of identification, assembly and transportation of cotton mills and export outlets.
Electrical peak loads and the changing tobacco curing process.
A comprehensive econometric model of the United States tobacco industry.
Social organization for development of low-income rural counties.
Defining and achieving life goals: a process of human resource development.
Minimizing the adverse effects of potential water shortage in South Carolina.
Economics of farm machinery management.
A cost and return analysis of irrigation corn and soybeans with sprinkler irrigation.
Interregional trade model of the South Carolina coastal tomato industry.
Organization and efficiency of the fruit and vegetable production marketing subsector in the South.
An economic evaluation of alternative investment and financing plans.
The impacts of technical and economic changes on South Carolina farms.
The impact of selected institutional factors on South Carolina agriculture.
Local fiscal impact of economic-demographic change in South Carolina.
Price discovery and informational flows for major agricultural commodities in the Southern Region.
Social and economic impact of adopting mechanical tobacco harvester in South Carolina.
Structures and adjustments of South Carolina agricultural sector.
Providing basic agricultural marketing information for program and facility planning.

**Agricultural Engineering**

Quality housing environment for low-income families.

Development and evaluation of oyster harvesting equipment and mariculture systems.

Nutrient management of poultry waste with biological treatment processes.

Mechanization of tobacco harvesting and curing systems.

Utilization of cattle feedlot waste through land application.

Soil and environmental factors affecting longevity and productivity of peach trees.

Soybean production and management simulation models.

Development of hydrologic/water quality models for agriculture and forestry.

Mechanization of okra harvesting.

Storage of baled coastal bermudagrass hay.

Automatic controller to improve harvest efficiency and reduce soybean damage.

Checklist and training guidelines for agricultural workers' safety.

Solar energy for home heating.

Non-point source pollution from grassed and forested land in the Piedmont of South Carolina.

Mechanized sorting of peaches.

Bulk handling systems for machine harvested tree fruit crops.

Cultural practices and energy relationships for irrigated production in South Carolina.

Engineering systems and energy needs for cotton production.

Utilizing anaerobic livestock and poultry lagoon sludge.

Potential for ambient air grain drying in South Carolina.

Housing for low- and moderate-income families.

Utilizing swine lagoon effluent on forest land.

Flue-cured tobacco bulk curing technology.

Computers in agriculture.

Animal waste utilization and treatment systems.

**Agronomy and Soils**

Sulfur supply of air, rainwater and soil as related to agronomic and horticultural crop needs.

Adaptation and breeding of a cool-season forage grass species.
Plant analysis for complementing soil tests in evaluation of nutrient availability.

Heat-drought tolerance in Trifolium spp. and soybeans.

Sorghums for silage production.

Hybrids for supplementary summer pastures.

Soil-water and plant water relations in soybeans as related to root growth.

Soil biophysical factors affecting soybean root growth, nitrogen fixation and yields.

Cytogenetic studies of white clover and related species.

Tobacco production.

Tobacco breeding and genetics.

Diagnosis and correction of boron and manganese problems in crop production.

Development of weed control practices in corn, cotton and soybeans.

Production, propagation, evaluation of inter-specific forage legumes through cell and callus culture.

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 South Carolina.

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 South Carolina.

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.

Small grain breeding.
Evaluation of selected varieties and advanced experimental strains of cotton.
Evaluation of corn hybrids and advanced breeding lines.
Evaluation of selected varieties and advanced experimental strains of soybeans.
Evaluation of varieties and experimental strains of wheat, oats, barley and rye.
Evaluation of selected grain sorghum hybrids.

Animal Science
Genotypic and phenotypic response of crossbred cattle under different levels of management.
Factors influencing nitrogen utilization in the equine.
Comparison of methods of measuring composition in the live animal.
Roasted corn in diets for growing-finishing pigs.
Productivity of gilts fed two levels of calcium and phosphorus in confinement.
EMME as a selection instrument for swine.
Forage systems for backgrounding and finishing cattle.
Caloric density of diets for 3-week old pigs.
Regulation of reproduction in beef and dairy cattle with exogenous hormones.
Monensin and corrugated paper boxes in growing and finishing rations for steers.
Marketability and acceptability of beef produced under forage-grain management systems.
Ensiled poultry manure for cattle.
Forage systems for production of beef from conception to slaughter.
Toxicity studies on ammoniated corn in beef cattle (steers).
Reproductive physiology of farm animals.

Dairy Science
Innovative materials handling for packaging and distributing milk.
Ensiled complete rations for lactating cattle.
Feeding value of fermented colostrum for pre-ruminant calves.
The role of energy compounds and hormones in regulating lipid metabolism in ruminants.
Effect of age and quality of raw milk on the shelf-life of the processed fluid product.
Aflatoxin B₁ consumption and stability of related metabolites in milk and tissue.
Role of the uterus in embryonic survival and mortality.
Improving reproductive efficiency in South Carolina dairy herds.
Factors affecting nitrogen economy of the bovine.
Utilization of solid and liquid constituents of manure in dairy waste management systems.
Virus diseases affecting reproductive efficiency in dairy cattle and swine.

Entomology and Economic Zoology
Alfalfa insect pest management.
Development of pathogens for use in a pest management system for soybean insects.
Bionomics and control of insects on cotton.
Insects as hosts and vectors of viruses.
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*.
Pathological relationships between insects and biological control agents.
An integrated system for the suppression of the boll weevil.
Control tactics and management systems for arthropod pests of soybeans.
Tobacco insect investigations.
Biology and control of insects attacking ornamental and greenhouse plants.
Analysis of predation of *Mercenaria mercenaria* by decapod crustaceans.
Ecology and management of wood ducks (*Aix sponsa*) in South Carolina.
Freshwater food animals.
Development of alternative control methods to mirex and chlordane for the imported fire ant.
Some important aspects of reproduction in feral swine populations in South Carolina.
Development and evaluation of soybean cultivars resistant to insect pests.
Biology and control of arthropods affecting man and animals.
Epizootiology and transmission of leucocytozoonosis in poultry.
Development of a grower treatment algorithm for insect pests of cotton.
Bionomics and control of billbugs injurious to corn.  
Participation in the Pesticide Impact Assessment program.  
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.  
Comprehensive, economically and environmentally sound system of integrated pest management for soybeans.  
Control of arthropods on apples.  
Control of vegetable insects in the Piedmont of South Carolina.  
Identification and distribution of insects of economic importance in South Carolina.  

Food Science  
Oral contraceptives and nutritional status.  
Composition, nutritive value and stability of poultry meat and egg products.  
Quality of dried sausages.  
Microbial injury and food quality.  
Factors influencing nutrient absorption.  
Relation of nutrition to porcine stress syndrome.  
Zinc and cadmium status of children and adolescents in South Carolina.  
Nutritional impact of fat-altered diets.  
Regulation of pituitary function during post-partum-anestrus in young beef cows.  
Postharvest physiology of fruits.  
Parametric studies on packaging of new foods.  
Enterotoxigenic clostridia and bacilli in foods.  
Nutritional effects of jejunoleal by-pass surgery.  
Quality maintenance and control in the marketing and storage of vegetables.  
Fermented peanut foods.  
Ethanol and sodium influence on perinatal development.  
Utilization of oilseed materials as human food.  
Effect of light on postharvest fruit.
School of Home Economics—Winthrop College

Patterns of food intake and nutritional health of girls.
Laboratory and consumer evaluation of comfort in fabrics from cotton and/or other fibers.
Defining and achieving life goals: a process of human resource development.
Erythrocyte protoporphysine and iron status of pregnant teenagers.
Effects of home laundering on the durability of fabrics for men's undershirts.
Career projections and attainment of low income youth: changes over time.

Horticulture

Cultural management of centipede grass.
Detection and evaluation of plant growth-environment relationships.
Breeding edible Southern peas.
Cultural and management practices for pecans.
Evaluation of woody ornamental plant material with respect to variety, production, propagation and marketing techniques.
Uses of seaweed and other organic materials in economically important horticultural crops.
Quality maintenance of mechanically harvested horticultural crops for fresh market.
Delayed ripening and senescence in peaches and other fruits.
Establishment and maintenance of scionwood and seed increase blocks for peach tree certification.
Breeding watermelons and evaluation of watermelon and cantaloupe varieties.
Improvement of turfgrass nutrition and associated management practices.
Tea, *Camellia sinensis*, culture, ecology, propagation and pest control.
Coastal lawn grasses, fruits and ornamentals.
Evaluation, improvement, horticultural crops and varieties.
Nutrition, management, horticultural crops and varieties.
Growth regulators and orchard designs for production of peaches.
Peach breeding.
Quality maintenance and improvement of processed horticultural crops.
Evaluation of strawberry cultivars for South Carolina.
Container growing medias and nutrient sources.

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Nitrogen requirements for containerized nursery plants in bark growth mixes.
Production, histology, breeding and genetics of mutagen induced dwarf pecans.
Plant germplasm—its introduction, maintenance and evaluation.
Improved practices for culture and management of peaches and grapes.
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 (Ramat.) and Saintpaulia ionantha (Wendl.) pot plants.
Grape germplasm evaluation for enological utilization.
Development of weed control practices for vegetable crops.
Feasibility of mechanizing the production of vegetables for fresh market and processing.
Apple production.
Evaluation of vegetable varieties and cultural practices.

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 root-stocks for peaches.
Disease control on vegetables.
Nature and extent of variation in rootknot and cyst nematodes.
Cause and control of diseases of shade and ornamental trees.
Reduction of aflatoxin development in corn by cultural practices and breeding.
Control of cylindrocladium blackrot (CBR) of peanuts and soybeans.
Epidemiology and control of fruit diseases in South Carolina.
Varietal, cultural and chemical control of nematodes in cotton and soybeans.
Causes and control of diseases of cereal grains in South Carolina.
Preharvest application of fungicides and their effect on cotton seed quality and seedling disease.
Chemical, cultural and varietal control of fungal diseases of soybeans.
Hoplolaimus columbus—effect of biophysical factors on distribution, production and pathogenicity.
Tobacco disease control in South Carolina.
Forage legume viruses.
Viruses and mycoplasm-like organisms causing disease of corn and soybeans.
Mycotoxins of corn and other feed grains.
Cause and control of Piedmont and mountain vegetable diseases.
Physiological and biochemical mechanism of herbicide action.
Role of nutritional stress and infection by Clitocybe Tabescens on bacterial canker of peach.
Causes and control of diseases of ornamental crops.
White clover pathology, virus and other diseases.

Poultry Science
Improving production efficiency of meat type poultry.
Environmental effects on chickens.
Immune response of chickens and turkeys vaccinated against fowl cholera disease.
Leucocytozoon disease of turkeys: hematology, immunology and control.
Composition, nutritive value and stability of poultry meat and egg products.
Nutrition requirements of market age rabbits.
Rabbit coccidiosis: pathological effects, prevention and control.
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Experiment Station Publications, 1978-1979

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1714—Effects of Snow on Browse Production. Gambel Oak, John R. Sweeney, James M. Sweeney and Harold W. Steinhoff.

1715—Isolation of Profuralin Degraders from Soil. Kathleen A. Stralka and N. C. Camper.

The Cooperative Extension Service conducts statewide programs in continuing education in 16 disciplines relating to agriculture, home economics, youth and community development, programs for the economically disadvantaged and educational information under a Memorandum of Understanding between Clemson University and the United States Department of Agriculture.

Objectives of Extension are closely related to those of the federal enabling legislation, the Smith-Lever Act, which assigns it the mission of disseminating useful and practical information to all citizens on matters within its assigned areas of responsibility. The Act provides for cooperation of federal, state and county governments in planning, financing and conducting programs.

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

The Service conducts active educational programs for the producers of all crop and livestock commodities of economic importance; carries out programs in marketing and utilization; and directs a wide variety of programs ranging from home economics to community and resource development. In carrying out its missions, Extension attempts to achieve maximum coordination with all county, state and federal agencies.

Extension is built around the concern and dedication of local citizens and community leaders who help guide its programs. In every community of every South Carolina county, citizens serve as volunteer leaders and members of program planning committees and advisory boards.

Through Extension, Clemson maintains an office in each county seat of South Carolina, staffed by county agent personnel. At the University a professional staff of Extension subject matter specialists compiles information from research results and translates this into usable data for the people of South Carolina. This ensures a constant flow of information to producers, homemakers and youth in all counties.

Extension staff members are teachers. They carry Clemson University's outreach educational program to all areas of South Caro-
lina and are at home in any classroom—tobacco field, dairy barn, assembly hall, homemakers’ kitchen or 4-H camp.

Implementation of the service’s programs is carried out under six broad program areas: agriculture and natural resources, 4-H, home economics, community and resource development, and special program.

**Agriculture and Natural Resources**

When Extension began in 1914, the agenda of agricultural programs was simple and very closely related to crop and livestock production. But the agenda changed to keep pace with an expanding agriculture that was no longer simple.

Crop and livestock production is still important, but it concerns an increasing number of production opportunities which require complex systems of management. Minimum tillage, artificial insemination and integrated pest management have moved off the experiment station and onto the farm.

Energy and environment dominate the farmers’ thinking, if not by choice, then by necessity. Adequate financing requires a knowledge of cash flows and tax management.

Today’s farmer realizes he must market the crop he produces. He is interested in the consumer; he is interested in foreign trade; he is interested in governmental policy and regulation.

Productivity must be balanced with pleasure. Clean air, a comfortable home, beautiful flowers and shrubs, recreational opportunities—all are an integral part of a healthy agriculture—of healthy families and healthy communities.

This is the educational agenda for Agriculture and Natural Resources. The Cooperative Extension Service of Clemson University is committed to these goals. Highlights of Extension activities in some dozen departments at Clemson and in the State’s 46 counties follow.

**Agricultural Engineering**

One of the most challenging aspects of farming today is to understand and apply the complex technologies that pertain to it. In this regard no discipline is more technical and exacting than engineering as it applies to agriculture.

County Extension agents in South Carolina’s counties are hard pressed to provide all information requested of them, such as the technical aspects of conforming to environmental regulations, cali-
brating machinery for delivering precise amounts of spray to crops, adjusting harvesters to minimize field losses and planning farm structures, to name a few.

Fortunately, county agents can call on agricultural engineers on the state Extension staff at Clemson University for advice and demonstrations and can use programs of instruction that are developed by staff engineers at Clemson.

These staff engineers have a continuing interest in matters affecting all South Carolinians. One such activity is working to help bring about more purity of water sources through implementation of the South Carolina 208 Plan for Water Quality by achieving better non-point source pollution control.

Companion activities of agricultural engineers were development of design and management criteria for high-density livestock and poultry production facilities that protect the quality of air, water and soil resources.

A June irrigation tour of selected farms in eight counties demonstrated the successful use of both pivot and traveler irrigation equipment in South Carolina. These gave farmers an opportunity to observe the latest irrigation technology and management of these systems.

New programs and teaching aids in home safety and home security against fires and intruders were disseminated.

Another popular area of activity included home heating with wood, chainsaw safety, and stove selection, installation and operation.

Alternative sources of energy such as alcohol for use in agricultural production and transportation became a focal point of intense interest. Many individuals and groups were interested in learning more about the technology of producing alcohol from agricultural crops and residues.

Conservation of household energy, retrofitting and energy alternatives continue to be active areas of high interest by home owners. Increases in cost and availability of fossil fuels stimulated interest in solar energy for residence.

South Carolina grain producers are moving toward centralized grain facilities that improve handling efficiency and reduce labor and energy inputs. On-farm storage capacities are being expanded by many producers with assistance from agricultural engineers.

Energy requirements for agricultural production is of utmost concern to producers. New evaluations will be made for all tillage
and cultural practices with emphasis given to achieving higher levels of efficiency.

Agronomy

Extension Agronomy, through its state staff and 46 county Extension offices, provides a wide spectrum of educational and advisory services to farmers across the State.

The successful growing of field crops requires extensive knowledge, keen observation, careful timing, good management and an inquiring mind. Like practice in other fields, farming is a rapidly changing occupation, requiring constant updating.

Extension Agronomy attempts to stay in the forefront of new developments and trends and to take these quickly to farmers. Last year's activities include:

In the winter months, Extension Agronomy workers conducted 20 county field crop production meetings in the State with some 600 growers in attendance. At these meetings, agronomy specialists, in cooperation with specialists from other departments, presented Clemson University’s recommended practices for corn, soybeans and other crops—crops grown on more than 2 million acres in the State.

In 1978 several soybean on-farm demonstrations were conducted. A demonstration of special significance was carried out on a farm in Darlington County where several systems for sicklepod control were evaluated. To help make local soybean growers aware of efficient chemical control systems for this emerging weed pest, a tour was conducted with some 60 growers present.

Agronomists also carried out 16 county soybean variety demonstrations during the year. Variety selection is a key soybean management decision. This type of demonstration, with other information provided in newsletters and bulletins, helps the grower to match his particular set of conditions and needs with one or more adapted varieties.

Three efforts were directed toward urging tobacco growers to increase their profits for 1979:

• Ten thousand copies of a new Extension bulletin, “South Carolina Tobacco Grower’s Guide—1979,” were distributed to growers in the State.

• Twenty-one grower meetings were held with 737 growers in attendance.
• Fifteen on-farm demonstrations were conducted in various places in the tobacco production area.

In addition, continued efforts were made on the “Top-Early” program started in 1978, with special emphasis on reducing residues. A new program of timely dropping of the bottom leaves from the tobacco stalk was started based on 1978 research efforts.

Cotton yields produced this year were the highest ever for South Carolina—562 pounds of lint per acre. Four regional cotton production meetings were held and tours of demonstration projects were conducted to emphasize the importance of following recommended practices in a timely and accurate way.

In forage demonstrations, quality improvement was emphasized. In most cases this involved adding legumes to the forage system. In one demonstration, close grazing plus other management practices showed that 600 pounds of beef could be produced per acre of coastal bermudagrass.

Intensive grazing management studies with cow-calf herds were initiated in three counties. Demonstrations included new varieties of alfalfa, red clover, bermudagrass and subterranean clover. Acreage of arrowleaf clover and alfalfa continued to increase.

In 1979, several test-demonstrations in weed control were conducted. Control of weeds that are a serious problem was emphasized with most on-farm test-demonstrations involving weed control in soybeans. Two test-demonstrations involved weed control in cotton and were included as optional stops for the North Carolina-South Carolina Weed Tour. Some 30 agricultural chemical industry representatives visited the sites.

A tour for county Extension agents was also conducted so that agents would see the results first hand and ask questions.

On-farm test-demonstrations play a primary role in weed control. When used with other pertinent information supplied through newsletters and bulletins, a strong foundation is provided on which producers can base their decisions to formulate an effective and economical weed control program.

During the past twelve months, 67,471 soil samples were submitted to the soil testing laboratory by farmers and homeowners. A program to make use of the computer for writing fertilizer recommendations was initiated this year.

Pasture renovation demonstrations were initiated in three more counties. Three corn fertility demonstrations were also started on fertilizer placement for corn production.
Animal Science

The Extension Animal Science section is charged with developing and implementing statewide educational programs for beef, swine and horse enterprises.

Interest in horses continues to grow in South Carolina, and 150 to 200 shows are held annually. As expected, rapid growth in this industry has created a tremendous demand for horse activities, educational programs and riding trails. Interest has also established a new and somewhat competitive market for hay and grains.

The keen interest in horses is most evident in county and regional 4-H activities and horse camp. Two horse camps are held each summer with some 130 4-H’ers attending each week. Grooming, fitting, showing and management are emphasized.

The regional horse show, held in Mississippi this year, will have some 30 4-H’ers from South Carolina participating.

Favorable prices (early in the year) and improved feeder pig markets throughout the State have encouraged continued expansion of swine.

A few years ago, swine production was viewed as an enterprise to supplement farm income, but today it is a high investment business providing a major source of income on many farms.

Expanded feeder pig markets are important to the industry because they provide a pooling arrangement for small producers and allow larger feeders to purchase in volume. The purchaser of these pigs can remain at home, buy by Tele-O-Auction and expend only 15-20 minutes of his time.

During the year, swine numbers reached an all-time high but tumbled late in the period. This will put some producers in a critical financial bind. Investment and production costs are constantly rising. For those with less than desirable management, this price squeeze could be disastrous.

County swine meetings, workshops and farm visits were used to inform and update swine producers.

The S. C. Swine Evaluation Center enjoyed excellent support and prices on boars tested. Although prices will decline due to over-population of swine, tested boars will serve as a way to improve litter weights, quality and efficiency of gain through the depressed market ahead.

Beef cattle numbers tumbled during the past several years, and prices climbed to new highs. Cattle numbers have leveled off, and the rebuilding of herds now appears evident.
Profits now seem assured for the cow-calf producer, at least for the short term. However, South Carolina producers need an attitude adjustment. Beef cattle expansion should be approached in a businesslike manner. Farm by-products and acreage, marginal in row crop yields, should be emphasized in their expansion program. Although the presently high beef prices will show profits under less favorable management, best management practices and most efficient production methods will be emphasized.

Cow-calf producers were encouraged through county educational meetings and farm visits to establish goals, keep meaningful records and establish strict breeding and calving dates.

The S. C. Bull Gain Test continues to grow in popularity for both consignors and buyers. The sale average for 1978-79 set a new high. However, a larger percentage of the better bulls should be placed into purebred herds to improve seed stock.

**Dairy Science**

Dairy Extension personnel continued to work with county agents and dairy interests throughout the State in providing educational information to producer and consumer interests.

Among highlights of activities conducted were:

A two-day seminar session was conducted on artificial insemination (AI) breeding with 125 attending, and a Dairy Herd Improvement (DHI) conference was held to inform producers on new programs.

A dairy product survey was reinstated to inventory various dairy products. The urban 4-H program was expanded and 2,500 urban children with only a meager knowledge of the dairy industry were better informed about the industry. Continued emphasis was given to butterfat testing, bulk milk hauling, technical sessions, monthly publications of “Milk Price Highlights” and milking machine testing demonstrations.

A screening program was conducted for Blue-tongue related hoof problems in 12 dairy herds. An AI course was conducted in Dorchester County, and two seminars in food animal medicine for South Carolina veterinarians were arranged. Three videotapes on calving, dehorning and castration were prepared for county agents and producers. A specialist worked with 10 dairies on breeding problems and began milking machine evaluation and mastitis control programs.
A computerized feeding program was implemented and presented to more than 50 dairymen. Some 300 samples of hay silage were tested, and in many cases feeding and crop recommendations were made based on test results. In response to the feed situation resulting from drought, Dairy Extension helped revise feeding programs to minimize economic losses by dairymen, holding 10 county meetings and contacting some 500 other interested individuals on emergency procedures.

A 4-H dairy camp was conducted at Camp Long with 125 high achieving young people attending. A heifer project was developed for youth who live in rural areas but not on farms. Some 200 animals were shown at the State Fair Junior Dairy Show to highlight 1978 activities.

**Entomology and Wildlife**

The most significant step forward for Extension Entomology programs in some time was due to the placement of area field crop entomologists at the Pee Dee and Edisto experiment stations. These entomologists join the Extension teams now being formed at the branch stations and will enable Extension to assist producers more effectively.

Integrated Pest Management (IPM) programs continue to receive acceptance from growers in S. C. Cotton, soybeans and tomatoes are crops on which IPM has proven that production can be maintained with less use of pesticides. Fewer trips through the field in spray operations saves chemical and energy dollars. New IPM programs are being planned for other crops such as tobacco and alfalfa.

Effective pest management requires that producers be kept informed about pest conditions. A new toll free HOTLINE service was initiated for the 1979 season from the Pee Dee Station. The area entomologist maintains automatic recording equipment with current insect/crop summaries. This HOTLINE is available to growers, agents and others day or night.

Extension Entomology continues to lead the pesticide training program for the College of Agriculture. Despite the small number of restricted use pesticides on the market (which require applicator licensing), we still receive a steady demand for training programs, especially from commercial applicators.

A Wildlife Conservation Workshop was held at Camp St. Mary’s near Beaufort, May 3-5. The 90-plus participants included 4-H
teen leaders and adult volunteers from the tri-county area around Beaufort. They learned about wildlife, wildlife habitat, management and problems from wildlife experts who work in the State. The group camped out and enjoyed field trips around the coastal marshes.

Wildlife this year emphasized aquaculture or the management of small farm ponds for food fish with 50,000 farm ponds in the State. We have a tremendous potential in fish culture for home use and for sale to local outlets.

Twelve farm pond clinics have been held across the State, most of which have been cooperative efforts with U.S.D.A. soil conservation service. Local pond owners attend these clinics to learn how to better manage their ponds. Most clinics were held at a pond site, but some were held at night with fish frys or fish stews served. The Extension Service had 100 participants at a clinic in Newberry, an area of tremendous interest in aquaculture.

Small landowners are looking for ways to increase their income from the land. They are becoming aware of the success of small fish farmers in other states who are averaging $400 an acre growing channel catfish. The requests from landowners are overwhelming on this subject.

This interest is reflected in the response to the farm pond in-service training to be held January 1980. We have 46 Extension professionals signed up representing 31 counties. A large number of these people are county agent leaders.

The rapid growth of aquaculture-related work has caused the wildlife specialist to devote less time to ongoing programs in vertebrate pest control, game management and youth work. If the aquaculture industry takes root in South Carolina, we will not be able to carry on an effective Extension program without a fisheries Extension specialist.

Food Science

More than 2,000 notices of proposals, changes and new federal and state regulations were distributed to over 600 South Carolina food industry companies by food science's Food Regulations Information Filter Center (FRIFC). This activity enabled the industry to (1) frequently take part in the promulgation process of new regulations and (2) avoid possible citations, fines or adverse publicity by having sufficient lead time to implement necessary changes to assure regulatory compliances.
The food science project area directed approximately 35 percent of its effort towards in-plant demonstrations to encourage implementation of improved food processing and preservation technology for (1) increased operating efficiencies, (2) maximized product yield, (3) improved existing product acceptability and (4) commercialization of new food products/processes.

Successful efforts included processing modifications by one South Carolina seafood company which enabled them to produce pasteurized crab meat and pasteurized oyster products having improved flavor plus a substantially increased shelf-life. Another effort resulted in the marketing of a newly created product, ready-to-heat-and-eat canned chitterlings, by a new food business venture; and the introduction of a brine-fermented canned okra having superior color, flavor and appearance characteristics as a new product line extension by another South Carolina canning company.

Work on utilization of food processing wastes continued to be emphasized during 1978-79. Darlington County was chosen to demonstrate land application techniques as a possible beneficial use for shrimphead wastes. In South Carolina, the shrimp processing industry will annually have 3 to 6 million pounds of waste to dispose of in an alternate manner since recycling the material back into an estuary has become restricted due to increasing environmental pressures and regulatory restrictions.

Another project was initiated to characterize the waste discharges by the State's peach canning industry. When completed, possible utilization demonstrations can then be developed. In addition, 18 community canneries were provided advisories on standardizing equipment and operating procedures to improve the canned quality of home garden produce.

During the winter, many South Carolinians experienced two- to four-day power failures resulting in the outage of home freezers/refrigerators and instances of home food supply shortages due to inclement weather. In order to assist families having similar natural/man-made emergencies in the future, food science developed demonstrations and distributed leaflets on how to select and assemble a "3-Day Emergency Meal Kit" for a family of four which consisted of non-refrigerated storable foods.

Forestry

Extension Forestry activities during the past year have concentrated on timber marketing, economics of forestry as an investment,
shortcourses for professionals, and the initiation of competitive events for young people.

The infrequency of sales of forest products by landowners continues to provide new audiences for timber marketing information. During the past year marketing workshops were held for landowners throughout the Pee Dee region and in other scattered locations. Efforts were also under way to improve on the availability of current market information. In addition a bulletin on marketing timber has been prepared and will be distributed late this summer.

Frequently, timber is not looked at as a crop but is considered as a source of income in emergency situations. Extension Forestry has initiated a long-term project to address the economics of forestry as an investment. At present, a two-workbook series is being prepared to compare a price plantation investment with other forms of investment. Additional materials will be prepared in the future.

During the year a memorandum of understanding was developed between Clemson and the LSU/MSU Logging and Forestry Operations Center. The result has been a new group called the Forestry and Harvesting Training Center. During the past year this group held four workshops at Clemson University. This will be a continuing program to provide training for professionals involved in the forest products industry.

Another activity is the initiation of plans for competitive forestry events for young people. The first competition will be on a pilot basis in September. Plans are to perfect the system and develop a statewide youth program in forestry which will culminate in competitive events. There is considerable enthusiasm for this undertaking. We are looking forward to the opportunity to involve youth in understanding our forest treasures.

Horticulture

Extension Horticulture is responsible for disseminating information on fruit, vegetables and ornamental crops in South Carolina. While the unit is primarily production-oriented, it is also involved in postharvest handling and marketing.

The industry represented by ornamental plant production, maintenance and design is clearly one of the largest agricultural based industries in the State, estimated by some sources to be valued at about $250 million. Shortcourses are offered for greenhouse op-
erators, florists, turf, ornamental maintenance, landscape and nur­

gery industrymen to keep them current on latest research findings
as they attempt to be successful in a highly competitive business.
Problem clinics held in shopping malls reached some 30,000 citi­
zens, and specialists produced some 400 radio and 100 TV pro­
grams for mass media. More were produced at the county level.

Production for direct-to-the-consumer marketing of vegetables
has been stressed through county classes, literature and media
work. Sixteen counties have organized county or city markets to
help small growers sell vegetables directly to the consumer. Simi­
larly, pick-your-own production of many horticulture crops has
increased. Many of these growers are new and received basic
production instruction through Extension.

Area agents and paraprofessionals have been appointed to assist
small farmers with production of vegetables. Pilot projects in
Anderson and Beaufort counties have proved the effectiveness of
paraprofessionals. Demonstrations in this area include herbicides,
cultivation methods, varieties, fertility and new crops.

Commercial vegetable programs emphasize management of pests.
Scouting programs in Charleston and Beaufort counties were ex­
panded. Through this technique, growers were able to eliminate
nine sprays. Through efforts of Extension, research and the Pest
Regulatory Service in the special needs labeling of pesticides,
growers were awarded the use of several new pesticides.

Fruit programs with small farmers were increased. Three blue­
berry demonstration plantings were established in Beaufort, Wil­
liamsburg and Sumter counties to teach and evaluate the crop for
low income grower use. New publications have been completed on
blueberry and blackberry production.

Apple pest management programs have been established. The
program centers around an effort to survey the industry for alterna­
tives in pest control. Demonstrations include fertility, varieties
and postharvest studies.

Peaches return more than $45 million to South Carolina pro­
ducers, and a source of true-to-type trees is important. Variety type
is important because harvest schedule and quality are maintained
by selecting proper strains. Extension has supported development
of certification standards and programs. Responsibility for pest
management programs has been shifted to the growers, and Exten­
sion efforts are now directed toward getting the grower to adopt
practices outlined during the special pest management programs.

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Extension has participated in all peach festival activities to promote the industry. Slide/tape displays were viewed by more than 150,000 persons. The persons visiting these events helped evaluate various processes of peach nectar, a product under investigation by processing specialists. Peach situation newsletters are routinely published to update growers on production techniques.

Extension pecan activities are directed at two phases of production—rejuvenation and new planting. The Pecan Field Day was attended by 225 growers. The State yield increase from 3 to 5 million pounds indicates the progress in rejuvenating old sites. There is keen interest in establishment of new orchards, and variety demonstrations assist farmers in making decisions regarding varieties.

Plant Pathology

Personnel of the Extension Plant Pathology Unit are responsible for the correct identification of plant damage and losses to diseases and for implementation of control recommendations for agriculture, home economics and 4-H programs.

Highlights for agriculture include the following:

Specialists took part in the team efforts on integrated pest management programs for peaches, tomatoes, apples and peanuts. Use of pesticides for disease control has been reduced substantially for tomatoes in the Charleston-Beaufort area. For peaches, the program has resulted in closer scrutiny of pest problems that have amounted to savings on pesticides, improvement of the environment, and increasing tree longevity. An apple integrated pest management IPM program has also been initiated.

Members of the unit were very active nationally and locally in attempts to keep the nematicide DBCP available to growers (especially for peaches, where there are no alternatives) in South Carolina.

The soybean cyst nematode has been found in six additional counties in the State. Actions to determine all locations of this serious pest are being made, and programs of recognition and control have been established. County Extension agents have received field training in recognition and control procedures.

Tobacco disease problems were determined, and control procedures and programs were updated and implemented. A serious field outbreak of tobacco blue mold disease was encountered in 1979.
A pollution training session for county agents was successfully conducted in 1979.

The home economics effort is concerned with the interest in home gardening caused by the high costs and shortages of energy. Participation in county and community-wide gardener meetings and preparation of printed recommendations for pest control is helping gardeners to better cope with pest problems.

The 4-H Plant Pathology program that was initiated in 1977 is gaining in momentum and popularity. Currently, 4,309 youngsters are enrolled in the program. Using the volunteer leader concept, this program is attractive to county Extension staffs as well.

Members of the Unit work in the “team” effort to solve plant problems and to develop and carry out control programs.

The interdisciplinary plant problem clinic for county Extension staffs processes approximately 3,000 plant and insect samples and 4,000 soil samples for nutrients and nematodes each year. This program has helped to unify the various disciplines and has strengthened Clemson’s approach to problem recognition and solving.

The peach and soybean team approach has proven highly effective in solving serious problems more efficiently and thoroughly. This approach is also used for other crops.

Poultry Science

There continues to be keen interest in computer evaluation of poultry contracts. As inflation advances building and equipment costs, frequent examinations are requested by producers to keep them aware of profit potential.

Specialists worked with several broiler and turkey contracting organizations on updating contracts, designing facilities and management programs. A successful health and management short-course was held for poultrymen. Poultry Science Extension worked closely with quail and rabbit processors in developing improved practices in processing and production.

Twelve new pullorum-typhoid blood testing agents were trained in conjunction with the National Poultry Improvement Plan.

The 4-H poultry judging and poultry barbecue programs continue to bring honor to our state. The Chesterfield County team won the National 4-H Poultry Judging Contest at Louisville, Ky. Likewise, the South Carolina poultry barbecue contestant from Lexington County won the National Poultry Barbecue contest. This was the third year in a row that South Carolina has won this event.
Extension youth programs continue to reach thousands of youngsters over the State with sound, technical knowledge through joint county agent-specialist efforts.

A great demand continues for specialists' time and travel to work with hobbyists, backyard producers and commercial interests. Radio, TV, news articles and county meetings are used to supplement personal visits, phone calls and letters in working with this vast number of poultry, gamebird and rabbit producers.

Production-Marketing Economics

Providing educational programs and training to farmers, agribusinesses, Extension agents and the public about agricultural marketing, farm management, financial management, agribusiness management, estate planning, income tax management, agricultural policy and trade, computer applications, youth (4-H) and consumer economics is a basic function of the Extension Production-Marketing Economics Group. These programs were conducted through farmer meetings, workshops, newsletters, publications, on-farm consultations, multi-disciplinary meetings and the mass media.

Farmers and agribusinesses produce and operate in an environment of risk and uncertainty created by inflation, energy shortages, changes in supply and demand (prices), weather and several other economic forces. The major program thrust in 1978-79 was to provide farmers and other firm managers with the economic training and tools of analysis to do a more effective job of managing risk and uncertainty. Risk management is reflected in decisions pertaining to what and how much to produce, marketing, financing, estate planning, income tax management and agricultural policy. The following programs were conducted to assist managers in improving their information base and ability to make decisions and manage risks: 15 marketing workshops and seminars; 10 farm management workshops and seminars; 30 outlook presentations; 20 county meetings of approximately 2.5 hours in length on agricultural policy, income taxes, estate planning, farm management and marketing; two training sessions with agricultural lenders; 60 cash flow and financial analyses for farmers and agricultural lenders; four training sessions on farm management, marketing and policy for county Extension agents; one statewide workshop on irrigation; several management sessions for low income and commercial cooperatives; five schools for tax practitioners (700 participants); and numerous county visits for consulting with farmers.
Literature development is a major part of the Extension Economics program. Last year, newsletters were prepared for 12 Outlook Updates and 12 Management Marketing Memos. Publications included 10 Extension Reports, 4 leaflets and 2 circulars. These materials covered a broad range of information on outlook, financing, planting decision, agricultural policy, tobacco, irrigation, leasing, income and estate taxes. Estimated cost and returns (budgets) for the major field crops and livestock enterprises were prepared and used extensively in production, policy, financial lending and marketing decisions. Additionally, weekly marketing reports for peaches, cucumbers, cotton and commodity futures were prepared as follows: 168,750 commodity reports, 12,000 peach reports, 1,200 cucumber reports, and 13,200 cotton reports.

With the increased emphasis on forward contracting, hedging, cash flow analysis and budgeting, producers need to be able to look logically at alternatives before making commitments. Computer programs dealing with cotton, corn, soybeans, wheat, livestock, cash flow analysis, and enterprise budgeting have been written and are currently available to producers. These programs were used extensively in 1978-79. Computer applications are being expanded to include the mini or personal computers that farmers can use in their homes.

Extension Home Economics

Scope of Activity

Extension Home Economics extends the resources of educational programs to the people in six subject matter areas: child development and family relations, clothing and textiles, family resource management, food and nutrition, home furnishings, and housing. Home economists provide leadership in the design, implementation and evaluation of these programs to improve family development and stability. As a result of these efforts, families are better able to identify their needs and opportunities, make decisions, utilize resources, and acquire competencies to interact effectively with others.

Highlights of home economics programs during 1978-79 include:

Child Development and Family Relations

This program is reaching broader audiences than in past years, while maintaining programs for traditional groups.

Family life programs, in the form of one or more meetings, were conducted in 87 percent of South Carolina counties. In addition,
over 65 percent of the counties had special interest programs in some area of family life. These special interest programs were aimed at families with young children, families with teenagers, and the aging population.

Over 100 programs on a wide variety of topics were conducted to appeal to the various groups. Topics included preparation for marriage, family communications, child development, babysitting, tensions, death and grief, selecting toys, family development, human relations, values, aging, retirement, and child abuse.

A program on parent-child interaction was piloted last year in three counties, reaching 38 families with young children. This was expanded this year to 9 more counties and has reached an estimated 150 young families with an in-depth educational program. Plans are to expand it to an additional 12 counties next year.

Clothing and Textiles

Extension cooperated with the South Carolina Extension Home­makers Council by counseling them on the clothing problems of the physically handicapped. Workshops were conducted in two districts, and four kits were developed on clothing adapted for the physically handicapped. The Council has had numerous fashion shows and exhibits to illustrate how clothing can be adapted.

Three leaflets were developed to show how to make some adap­tations. A slide program and videotape was produced to be used in public areas to help families become more aware of how the physically handicapped may wear attractive clothing and lead more independent lives.

Several videotape programs were initiated in clothing to help families extend their clothing dollar. These included better coordi­nation of clothes, recycling clothes and showing sewing techniques that enable home sewers to make more clothing. These videotapes were shown at Dutch Square Mall in Columbia and at other public places in the State.

Special news features were provided to the daily and weekly papers at peak clothing buying periods to provide families with effective buying information.

Television shorts were developed and shown to the public on effective management and buying practices.

More than half of the counties planned programs for adults and youth on clothing selection with emphasis on how to identify qual­ity, plan wardrobes, coordinate the new with the old, and buy children’s clothing and maternity wear.
Adults and youth in these programs were shown how to extend the life of their sewing machines and how to use them most effectively.

Sewing consultants were trained in Lexington County, enabling them to seek employment as teachers of clothing construction. This pilot program was designed to provide more effective sewing classes to the people. Sewing consultants have been operating successfully in Spartanburg County where six consultants were trained two years ago.

Training was given to county Extension home economists on how to sew current fashion fabrics and on shortcuts in clothing construction. Two hundred and fifty youth were trained in personal grooming to strengthen their self-image and help them improve their appearances for future employment. One of the programs was supported by the South Carolina Textile Manufacturers Association and a fabric manufacturer.

Family Resource Management

This interdisciplinary program brought together all county home economists for a three-day training meeting. Each specialist presented an overview of trends and program highlights. The Family Resource Management staff presented economic data which could be used in county program planning. Visuals and new materials were previewed for the groups, who rotated among six subject areas.

A popular program this year was on wills and estate planning. In March a two-day training program was held in Columbia where agents were introduced to new materials on this topic. Included was a Betamax videotape prepared by Dr. Al Tinsley using two attorneys who specialize in wills and estate planning. The humorous program covers many difficult concepts in an easy to follow format. County programs on wills and estate planning normally involve adult couples. The material covered ranges from simple to complex, depending upon the needs of the group.

A computer analysis of estate tax probability is available as a free service from Clemson. Additional materials are currently being developed to broaden the teaching base in this area. Leader kits and visuals will be available by September.

Increased concern about energy conservation and continuing inflation has produced a renewed interest in buying skills, especially in the area of household equipment. Numerous programs were conducted throughout the State on selection, use and care of both
major and small appliances. Several counties have held appliance fairs involving local dealers, district and national manufacturer representatives, utility home economists, and Extension personnel. Mall demonstrations and displays have also been used as a means of educating consumers on household equipment.

To provide county home economists with skills needed to teach this information, a two-day training session was offered to some 50 home economists at Winthrop College in Rock Hill. Winthrop and Clemson staff members planned and presented a program consisting of talks by manufacturer representatives, displays, demonstrations and laboratory experiences. To support the efforts in the equipment area, 15 leaflets on various appliances were prepared and are available for public distribution.

Emphasis on the need for consumer competencies in the marketplace was rewarded by a tremendous response to the Extension Service's metric home study course. This course was introduced in the spring of 1978, and in a year's time over 6,000 South Carolinians completed the 10 lessons covering basics of the metric system and its application to everyday life.

Increased numbers of working women and the energy situation often mean people cannot attend meetings, so Extension has distributed materials consumers can study at home. The metric home study course is an excellent example. Other materials on the working woman, legal talk for women, informed shopper and money talks were widely used in the State.

The need for additional operating funds is a problem in most counties. Equipment is costly but necessary if certain programs are to be taught effectively. In an effort to meet financial needs, three district level inservice training programs were held on the art of grantsmanship. Agents interested in pursuing grant monies were trained in proposal writing. Potential sources of funds were investigated, and as a result of efforts, at least two counties were awarded small grants for the purchase of teaching equipment. In one county a microwave oven was purchased. Another county submitted a proposal for five sewing machines to be shared by three counties. This, too, was awarded. It is expected that other home economists will use this training on how to acquire grants.

**Food and Nutrition**

Federally-funded foods and nutrition education programs conducted by Extension receive widespread attention.
Consumers are demanding assistance in food buying, nutrition-related health problems, energy conservation as it relates to food, food preservation, and improvement in personal nutritional status. Extension home economics agents in each of the 46 counties are responding. With assistance from state nutritionists, the county Extension staffs are offering programs to improve the nutritional status of citizens. The following are examples of programs offered:

Food Buying—Many counties have offered a workshop on becoming a better shopper. The three sessions teach consumers techniques for saving money at food stores using practical approaches that result in considerable savings.

Nutrition Related Health Problems—Obesity is a major health problem in South Carolina. It presents the individual with a risk factor to other diseases including diabetes, hypertension and coronary heart disease. To combat these risks, Extension is offering a new program that teaches sound nutrition principles and behavior modification. Extension home economics agents in the counties have received in-depth training in using this program, and it will be offered statewide this year.

Energy Conservation—Saving energy in food preparation can assist consumers in cutting their use of valuable resources. Counties have offered programs in this subject in conjunction with appliance fairs and equipment workshops. Mass media methods are used to spread this information to more citizens.

Food Preservation—Each year the Extension Service provides reliable and up-to-date information in food preservation and county Extension offices are a recognized source for methods, techniques and recipes for freezing, canning, drying, pickling and jelly making. About 100,000 copies of circulars, bulletins and leaflets on these subjects were distributed in 1978-79.

Personal Nutritional Status—Consumers have many questions on their personal nutritional status:

How necessary are food additives? What function does fiber play in the diet? How does sugar affect my health? Extension home economists provide answers. For instance, one program helps people understand nutrition labeling on food products.

In South Carolina, better eating habits will come about only if citizens are convinced of the benefit and the need, and these fit their criteria for good and acceptable food.
Expanded Food and Nutrition Education Program

The Expanded Food and Nutrition Education Program (EFNEP) has provided nutrition support through basic education in foods and related topics during 1978-79. Beginning in 1969, the program has since produced recognizable improvements toward more adequate diets, enjoyable meals and positive attitudes toward life for South Carolina families. This program is part of a nationwide effort to help families with limited resources improve their diets and nutritional status.

Since its inception the program has reached into 31 South Carolina counties. Last year 2,273 different families were involved in the adult phase of the State's program. During the period, 4,986 youth were reached through 4-H EFNEP. Efforts were continued to enhance coordination of the adult, youth and 4-H phases of the programs. Volunteer leaders were recruited and trained. An increasing number of enrolled graduated homemakers assumed volunteer responsibilities.

Efforts were made to enhance relationship between EFNEP and other agencies involved in delivering nutrition services, especially to improve the working relationship between the food stamp offices and the EFNEP. Also, special efforts are being made to enroll more homemakers who are food stamp recipients in the program.

There is concern by the EFNEP staff on assuring program participants they are being properly armed with current, scientific information regarding their basic nutritional needs, and that their food supply is adequate to meet all normal human requirements for nutrients. As in the past, EFNEP has ascribed to the philosophy of learning by doing; therefore, efforts such as test gardens, tours, demonstrations and client participation in all of these events are continually encouraged. This approach to education has long been known to be one of the most effective methods of bringing about changes in behavior.

The following illustrates the type of work being done with families in the EFNEP program in South Carolina: When this subject homemaker was enrolled, she had four children and was on welfare. She was receiving food stamps, but her children were not getting the right foods to eat. The baby was undernourished, and the homemaker did not prepare breakfast for the children. Instead, they ate junk food, if anything. She had a food freezer, but she did not know how to store food in it.
She stated that she had canned some vegetables, but all of them had spoiled. The children complained of not feeling good.

After determining some of the needs of the homemaker, the program assistant taught lessons on food buying, meal planning and food storage. She helped the homemaker to prepare dry meals and explained to her how to use them. Lessons were taught on meat, fruits and vegetables, and breads and cereals.

The homemaker became enthusiastic, asked questions and learned how to follow recipes. The program assistant taught her additional ways of utilizing her resources, such as canning fruits and vegetables, and how to blanch and store food in the freezer. Meat alternatives were taught as a means to cut the food budget. On the last visit, the homemaker told the program assistant how many new dishes she had learned to prepare and how she had properly stored extra food in the freezer.

She stated that her children were now feeling fine and going to school every day. She was most appreciative of the work that had been done.

**Home Furnishings**

The high level of inflation, resulting in a continuing rise in the cost of goods and services, has caused a revived interest in do-it-yourself decorating among all clientele. To help families cope, programs in furnishings were conducted in 44 of the 46 counties. These programs were in the form of workshops, special interest meetings, home and garden clinics, and Extension Homemakers Club meetings.

Interior decorating short courses were conducted in 22 of the 46 counties. This was a seven-lesson concentrated course emphasizing principles of good design, budgeting for furnishings, selecting quality furnishings, and do-it-yourself projects.

Demand for this course, and the fact that the counties report they always have a waiting list, is indicative of the number of homemakers wishing to be their own decorators.

Youth of the State are becoming more interested in improving their home environments. This is indicated by the increasing number taking advantage of a short course developed especially for them entitled “24-Hour Room Service.” This has been used with in-school groups, and some of the most successful efforts have been conducted as a mother-daughter team.
A three-day inservice training in window treatments was conducted in each of the three Extension districts. As a result of this training, many families are making their own window treatments, thus saving many dollars which may be applied to other needs.

Mass media was used for helps and hints to assist clientele who were unable to attend meetings, and a home study course has also been used. One county reported 148 homemakers enrolled, with 98 receiving certificates for completing it.

**Housing**

Housing may be considered the total home environment, which includes furnishings, landscaping, major and small household appliances, cost factors, safety, storage, etc. Major emphasis during the past year was on energy conservation, including winterizing homes, insulation, and do-it-yourself repairs.

Housing or housing related programs, and those on energy conservation, were conducted in a majority of the counties, including topics such as energy conservation, winterizing the home, insulation and solar energy. Other programs conducted in various counties include home improvement, interior design, storage, proper laundry techniques, simple home repairs, appliances, home ownership, safety, mobile homes, moisture and mildew control, and home security.

In addition to programs to help solve problems and meet needs of our clientele, Extension home economists have made extensive use of newsletters and mass media to disseminate housing information.

**4-H and Youth Development**

**Scope of Activity**

Extension's 4-H programs direct work through the county offices with youth of the State, in urban centers as well as the rural areas and small towns.

In 1977-78, participation in regular organized 4-H clubs in the State was 79,000. Another 27,000 were reached through educational television. An additional 5,000 boys and girls were enrolled in the youth phase of the Expanded Food and Nutrition Program conducted by Extension.

Emphasis in 4-H continues to be on the development of the individual and growth in human relationship skills.

Current 4-H projects or "learn-by-doing" experiences have taken on a new look. Along with the traditional livestock and cooking
projects from the early days of 4-H, modern activities include bicycle, small animal projects, veterinary science, small engines, consumer education, home environment and child development. Program areas are geared to meet the needs and interests of youth with all socio-economic backgrounds.

Volunteer Leadership Development

In 1975, following a report from the Volunteer Leadership Development Task Force, a statewide campaign to increase the number of volunteer 4-H leaders was begun. Since that time, the number of volunteer leaders has increased from 1,900 to 2,700, while the number of 4-H clubs has increased by 500. As a result, for each leader recruited a new 4-H club was formed, making possible 4-H club opportunities for additional boys and girls. As a result of this effort, 4-H reached an all-time enrollment high during the last fiscal year.

4-H Camp

South Carolina currently owns and operates two 4-H camps—Camp Bob Cooper and Camp Long. Since 1974, camp attendance has greatly increased, with a projection for a capacity 6,000 campers during the summer of 1979.

During this same period of time, emphasis at the camps has been upon maintenance and renovation, with a long-range goal of making both camps accessible to Extension audiences on a year-round basis. The goal has been realized at Camp Long, where conference facilities to accommodate approximately 100 are ready for operation. The projected completion date for similar facilities at Camp Bob Cooper will be the fall of 1980.

Either 4-H camp session provides a comprehensive camp program for 4-H’ers between 10 and 14 years of age. Older 4-H members have an opportunity for leadership experience at the camp sessions as well. This year, in an effort to provide yet additional opportunities for teenaged 4-H members, a counselor-in-training program was initiated to provide older 4-H members with an opportunity to develop leadership skills in camp situations. In addition to this program, additional forms of camping were initiated this year. On a trial basis, a campsite was located and prepared at Camp Bob Cooper so that 4-H members could experience camping in a tent. This and other alternative forms of camping will continue to be explored in the coming years in an attempt to provide a balanced curriculum to meet the needs of today’s youth.
To supplement county camp programs, special interest camps—including horse, dairy, natural resources, electric and teen leader retreat—completed the 1979 program.

Teen Leadership

The development of 4-H programs for teenaged 4-H'ers has been a thrust of the State 4-H department during the past five years. During that period, an 18 percent increase in the number of teenaged 4-H members has occurred. This success can be attributed in part to new programming, which has been directed at maintaining an expanded teen enrollment and has included teen leader retreats, citizenship shortcourse, organization of county teen leader clubs, and recognition of outstanding teen leader clubs. This emphasis upon teen programming will continue in the next five years, with a projected increase of 20 percent.

Community Development

Scope of Activities

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

Through the CD program, emphasis is placed on assisting community leaders, governing officials, organizations and professionals in other agencies to understand and solve community problems and to obtain maximum benefits from community resources through wise utilization. Assistance is provided in comprehensive community planning, leadership development, economic, manpower and career development, housing, leisure and cultural education, community services and facilities, ecology, natural resources and environment, government operations and finances, and human health. Highlights of accomplishments in several of these areas follow:

Leadership and Problem Identification Surveys

Surveys were conducted in five small towns and in one instance on a county-wide basis. CD specialists assisted county Extension
workers and community leaders in conducting the surveys. Questions pertaining to perceptions of community problems and needs were asked of those interviewed. Mayors and other local government officials endorsed the surveys by providing initial lists of persons to be contacted. These, in turn, provided names of others known to be knowledgeable of community problems. News media provided publicity to increase community awareness of survey activities. Survey results were reported at public meetings, and courses of action to address prioritized needs were planned and implemented. Examples of projects accomplished include the securing of two doctors in one community and the development of a multi-use recreational area in another. Three additional communities and one county have requested survey assistance during the current year. Another community has requested a second survey to update knowledge of current community problems and needs.

**Emphasis/South Carolina**

Through the CD program, Extension continues to assist the governor's office in conducting the Beautification and Community Improvement program by providing organizational support and maintenance to local and county-wide committees participating. Additional counties and local communities enter the program each year. Approximately 300 persons attended the 1979 Annual Awards program at which community achievements were recognized and rewarded.

**South Carolina Community Development Association (SCCDA)**

This association was organized with Extension assistance three years ago. Its purpose is to involve community development professionals and lay persons from a variety of organizations and agencies in joint efforts to address problems and issues. The theme for the 1979 annual program was "Getting People to Live in the Community." Problem areas facing communities were discussed by panels of professionals involved intimately with those problems on a day-to-day basis. Small group discussions followed and conclusions were reported back to the entire group. One hundred and fifty persons participated in this program.

**Local Government Operations and Finance**

Extension CD specialists and county Extension workers developed closer working relationships with several agencies involved in assisting local governments during 1979. Activities included participation in a jointly sponsored workshop for local government
officials in the Upper Savannah Region on the role of planning commissions, preparation of personnel policy manuals for small towns in conjunction with the South Carolina Municipal Association, development of publications by CD specialists on Financing Smaller Cities, Liability and Risk Management for Local Officials, and County and Local Governments in South Carolina.

Efforts were also begun in 1979 to develop a comprehensive training program for local government officials on efficient methods of accounting and management for county and municipal officials. The program will be coordinated with other agencies including the governor’s office, the State Personnel Division, the Bureau of Governmental Research of the University of South Carolina, the College of Charleston, Furman University, the South Carolina Municipal Association and the South Carolina Association of Counties. CD specialists involved in this area of programming attended several state and national workshops to increase their expertise and share their knowledge with counterparts from other states during 1979.

Comprehensive Community Planning

CD specialists and county Extension workers continued their participation in local and areawide planning activities through membership on planning commissions, committees of regional planning and development agencies and through consultative involvement with professional planners in rural planning activities. Direct technical assistance was provided to counties and municipalities on issues such as agricultural land preservation, rural planning and land use regulations, economic development, and pollution control. CD specialist-produced publications entitled “Facts About Land-use Planning” and “Private Property Rights and Land-Use Regulation” were well received by the general public and professional planners.

Environment and Natural Resources

In conjunction with the U. S. Environmental Protection Agency, Oklahoma State University, and the South Carolina Department of Health and Environmental Control, CD specialists conducted workshops for local groups and government officials on innovative and alternative technologies for municipal wastewater treatment. The objective is to demonstrate how wastewater can be utilized in agricultural production, eliminating the need for costly treatment facilities in instances where these technologies can be employed.
During 1979, 20 workshops were held across the State involving over 300 participants.

**Federal Assistance Program Retrieval System (FAPRS)**

The Extension CD program continues to provide up-to-date information on the availability of federal grants and loans applicable to specific projects various agencies and organizations are interested in conducting. Through this program computerized information is provided on the status of any grant and loan program listed in the Catalog of Federal Domestic Assistance. The service is utilized by clientele by completing a request application form available through local county Extension offices and the state CD office. Extension participated in three workshops in 1979 demonstrating the uses and capabilities of the system. Approximately 60 requests for information through the system were processed in 1979 in addition to several in-house utilizations in conjunction with Extension CD initiated projects. Changes and improvements in the FAPRS program during 1979 should make it an even more effective tool for identifying sources of federal assistance for community development projects in the future.

**Special Programs**

**Broad Scope of Activity**

The thrust of this program is to design and offer educational programs that will benefit those farmers who have not advanced in educational and economic progress to a significant extent and whose income and standard of living remains low. Farmers in this category are less likely to be influenced by mass media, circulars and bulletins and are not prone to subscribe to farm magazines. Thus sources of new information are few, and the factors which promote ideas and motivation are absent or nearly so.

Families in this group are rather numerous and often referred to as "small" farmers because their farm product output and income are both low. Standards which equate "success" in farming to high levels of productivity on extensive acreages would generally relegate these small farmers to its lowest status. But when "success" is measured by standards which place a value on the farm's ability to improve the family's food supply and its quality, provide employment for family members, and acquire rural values and benefit from other advantages of rural living, then these small farms rate higher as a social and economic good.
If productivity and economic gains for small farmers can be improved, it is not unreasonable to believe that society in general will be the beneficiary. This is the rationale under which Extension singles out the “small” farmer for more individualized instruction under Special Programs. Although more individualized, Extension still employs the demonstration concept of teaching which has been so successful in the past.

Farmers with limited income face many of the same problems larger farmers have, but problems are often more acute because of limited resources in land, equipment and money. Insufficient knowledge is also a primary characteristic of small farmers, and it is to that deficiency Extension directs its efforts.

Marketing

One of the serious problems small farmers have is selling their products most advantageously and for the most money. Low volume and lack of product quality work against marketing efficiency. The emphasis of Special Programs has been to increase quantities by assembling products from several producers at one time and place and giving public notice of sales and to improve quality by teaching producers the accepted standards for product quality, usually U. S. Grades. Significant progress has been made in selected areas of the State, notably with feeder pig and calf sales, contract marketing, roadside and co-op markets.

The greatest success affecting large numbers of small farmers of diverse kinds came from one of this unit’s programs which promoted establishment of small markets, now operating in most counties. These range in size and complexity from a designated place in a municipal parking lot to a 40-stall shed where farmers sell directly to customers.

Improving Production

Technical assistance in improving farm efficiency of the small farmer is another facet of this unit’s work. Last year on-farm demonstrations with several crop and livestock enterprises showed to the farmer and his peers the reactions of crops to fertilizers, herbicides, improved varieties and the like and updated methods of feeding and sanitation of livestock. “Small Farm” tours, workshops and mass media approaches were used to persuade other small farmers to adopt improved methods also.
Greenwood-McCormick Experience

Possibilities for improving the income of small farmers appear brighter in Greenwood and McCormick counties as a result of using paraprofessional workers to identify small farm leaders and other clientele who will be responsive to offers for educational help and who can encourage other small farmers to also improve their situations. Ninety percent of the rural farm population of these counties could be classed as small or part-time farmers. This situation offers considerable potential for improving incomes and standards of living if more of the small farmers can be approached and worked with on a person-to-person basis.
DIVISION OF REGULATORY AND PUBLIC SERVICE PROGRAMS

L. H. Senn, Director

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

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

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

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

The following report highlights the activities of the division during 1978-79.

Department of Fertilizer Inspection and Analysis


Some of the major activities of the department for the July 1, 1978-June 30, 1979, period follow:

(1st report—Final report may vary slightly)
Fertilizer usage data—tons .................. 820,283
No. of fertilizer samples procured and analyzed .... 6,363
Percentage of samples containing N, P$_2$O$_5$ and/or K$_2$O sampled July 1, 1978-March 31, 1979 not meeting guarantee within tolerance .......... 23.3
Percentage of fertilizer samples claiming secondary and/or micronutrients sampled July 1, 1978-March 31, 1979 not meeting guarantee in secondary and/or micronutrients within tolerance 10.9

No. of liming materials procured and analyzed 450
Total number of liming materials not meeting guarantee 17
Percent of liming materials deficient 3.8
Total number individual deficiencies in liming material samples 20
Number of irregularities other than underweight 2
Weight irregularities 9
Fines collected, payable to state treasurer $285.00
Penalties collected, payable to state treasurer $29,653.11
(Deficiencies where consumers not identifiable)
Fertilizer registration fees collected, payable to state treasurer $8,140.00
Lime registration fees collected, payable to state treasurer $690.00
Lime permit fees collected, payable to state treasurer $2,630.00
Fertilizer taxes turned over to state treasurer $213,274.00

Total monies sent to state treasurer $254,672.11

Fertilizer Movement in 1978-79

Fertilizer demand was relatively light during the fall; however, there was 6.2 percent increase in movement of mixed fertilizer and material over the very light movement of the previous fall. Much of the nitrogen material reported in October and November was actually stored on the farm and was not used until the spring. Excellent price incentive caused early buying of nitrogen. It was anticipated that higher cattle prices would encourage fall and early spring pasture fertilization, but a sharp increase in fertilizer use did not materialize. This was mainly because much of improved pasture acreage of previous years had badly deteriorated or had gone out of production.

Predominant spring and summer fertilization of 1979 was compressed into March, April and May. Fears of a temporary fertilizer shortage due to logistics did not materialize since there were periods of bad weather during the heavy movement period which
allowed diminishing stockpiles of raw materials to be replenished.

The total mixed fertilizer and materials movement for the fiscal year 1978-79 was 820,283 tons which was 2.7 percent less than the previous year.

Consumer Interest in Sampling

The number of fertilizer and liming material samples taken by inspectors was the greatest since 1963-64 and the second greatest number in the history of the department. Many of the 6,813 samples which were taken were taken at the request from consumers. This was especially true in coastal commercial vegetable area.

Changes in the South Carolina Fertilizer Law

The changes in the S. C. Fertilizer Law passed by the General Assembly in 1978 were fully implemented. The changes included allowing unlimited ratios and allowing farmers mixtures without prior registration. Permanent registration was also allowed. These changes were well accepted by consumers and the fertilizer industry. Several computer programs were implemented and used by the department in order to more efficiently administer the changes in the law.

Quality of Agricultural Liming Materials

Inspectors took 450 liming material samples, and only 17 were found deficient in one or more of individual guarantees.

It is apparent that the quality of liming materials sold in South Carolina has improved since the passing of the Agricultural Liming Materials Act of 1976.

Soil Amendment Regulation

On April 17, 1979, the General Assembly passed by resolution regulations controlling the sale of soil amendments in South Carolina. In the past, materials classified as soil amendments which had questionable value have been sold in the State. Soil amendments now must be registered with the Fertilizer Inspection and Analysis Department before they can be offered for sale. The most important prerequisite for registration approval is scientific proof that the material will perform as claimed. Many of the products previously sold are not backed by this proof.
The Crop Pest Act

*Nursery Inspections:* A total of 605 nurseries, greenhouses and vegetable transplant growers were inspected and certified to sell plant material. Applications were processed whereby 715 nursery dealers were also certified to sell plant material. An additional 485 establishments were visited on routine checks to determine compliance with quarantines and regulations and to provide assistance with pest problems. The numbers of nurseries and nursery dealers decreased approximately 17 and 13 per cent, respectively, from last year.

Insects and diseases encountered were those normally associated with greenhouse and ornamental stock both containerized and field grown, i.e. lacebugs, whiteflies, scales, spider mites, Japanese weevils, yellownecked caterpillar, powdery mildew, anthracnose, and leaf and stem blights.

*Sweet Potato Inspections:* Fifty-nine sweet potato inspections, including storage, plant bed and field inspections, were conducted for 28 growers in 12 counties. Regular and certified seed stock was involved.

Three hundred and two bushels of sweet potatoes were inspected, certified, and proper tags issued for movement to Florida, Washington and California.

A heavy infestation of sweet potato weevil was found in one of five storage rooms at the USDA Vegetable Breeding Laboratory in Charleston, S. C. Cultural and treatment procedures were initiated to reduce the possibility of reinfestation.

Sweet potato weevil was also reported for the first time in Georgetown County in table stock potatoes at the home of a local resident. The determination was made from a specimen submitted to the Plant Problem Clinic at Clemson. The potatoes were consumed and their source of origin is unknown. Additional surveys of home plantings of sweet potatoes are planned for the fall in the vicinity of the local residence.

*Miscellaneous Inspections:* Forty-eight "Phytosanitary Export Certificates," 38 state and 10 federal, were issued for agricultural planting seed, plant seedlings, nursery stock and assorted house plants destined to certain states, Canada and foreign countries. Twenty-one regular "Certificates of Plant Inspection" were issued
for regulated articles being moved or shipped within the United States. The majority were for assorted house plants being shipped to Florida and other southeastern states, but some went to the far northwest to the state of Washington.

Department personnel inspected approximately 6,235 acres of soybeans for the Seed Certification Department being grown for certification and also assisted them in the inspection of Tifton 44 grass being grown throughout the State under a certification program.

A "stop sale" notice was issued on approximately three-quarters of an acre of tomato transplants that were infected with early blight disease with the recommendation that they be disked under.

**Phony Peach:** During the 1978 survey season approximately 1.3 million peach trees were inspected for phony peach disease; 2,888 were diseased and destroyed or marked for grower removal. This indicates that the incidence of phony peach disease is 0.22 per cent. Again, the majority of diseased trees are in the Coastal Plains and Ridge areas of the State. However, some are being found in the Sandhills and Piedmont areas.

**Soybean Cyst Nematode:** Infestations were found for the first time in Calhoun, Darlington, Hampton and Sumter counties in July 1978. These were reported by Extension Service personnel or individual growers who had observed that a problem existed and contacted specialists for further diagnosis. Based on incomplete reports for June 1979, this pest is being detected in many more fields this year than last and is becoming a serious problem in the State.

**The Bee Disease Act**

A total of 3,127 bee colonies were inspected with 21 or 0.67 per cent found infected with foulbrood. Of the total inspected, approximately 1,700 colonies were certified for movement to Florida, New York and New Jersey; an additional 350 queen nuclei were also certified for shipment to New Jersey.

**South Carolina Pesticide Control Act**

**Registration:** A total of 528 companies registered 5,394 products in 1979. The number of pesticide samples collected and analyzed was 1,589, and 88 (5.5 per cent) were found deficient in one or more active ingredients. Stop sales were issued on those products found to be deficient. Registration fees collected totaled $89,292.50.
One Section 18, specific exemption, for two pesticides to control flies in caged poultry houses was submitted to the Environmental Protection Agency but was not acted upon prior to June 30, 1979. A total of 44 Section 24(c), special local need registrations, were issued by the department in accordance with the Federal Pesticide Control Act.

**Certification:** Pesticide dealers and applicators must be certified and licensed in order to sell, purchase and/or apply pesticides classified for "restricted use." The totals of licenses issued for 1979 are as follows: private—14,607; commercial and noncommercial—2,519; and pesticide dealers—515. The department collected $50,817.55 in certification fees.

Certification examinations were administered quarterly throughout the State with at least three locations for each quarterly session. Departmental personnel participated in numerous other training sessions for applicators and administered the examinations at the conclusion of each session.

**Education and Enforcement:** Structural pest inspections were conducted at 108 separate facilities in response to complaints by owners of differing reports by pest control firms of infestation and/or the appropriate treatment. As a result, 18 informal hearings were held and four warning letters were issued. In the majority of the investigations, the pest control firms agreed to correct any problems and/or refund fees to the owners.

Two investigations were conducted due to complaints of alleged pesticide drift. One involved ground application and one aerial application. A warning letter was issued to the aerial applicator. No misuse was found in the investigation of the ground application. Several honeybee killings were investigated for pesticide involvement. Regulatory action of a preventative nature is being considered.

Premises of 130 retail and wholesale lumber distributors were surveyed and inspected for powder post beetle infestations or conditions conducive to infestation. This was to determine the source of infestations which have caused periodic damage to homes in the State. Results indicate that infestations are not common on the premises of retail and wholesale tropical molding distributors. Infestations that do occur may result from improper kiln drying and/or prolonged storage caused by delays in wood importation or processing.
Numerous "stop sale" notices were issued for unregistered products, sale of "restricted use" products by unlicensed dealers, and other violations of the Act. Over 600 dealers were contacted to assist them in complying with the emergency suspension of 2,4,5-T and Silvex by the Environmental Protection Agency.

Three additional pesticide regulatory specialists were employed in February and have already given an added impetus to the overall pesticide program. The potential overall benefits of this program to the State are now beginning to reach fruition.

Cooperative State-Federal Programs

_Gypsy Moth:_ A total of 30 male moths were collected in 19 traps at nine locations in the Myrtle Beach area of Horry County. Eight of the locations were in campgrounds and the other was approximately two miles from a campground. Other areas and traps in the State were negative for gypsy moth.

A cooperative four-day survey with USDA, APHIS, S. C. Commission of Forestry, and Plant Pest Regulatory Service personnel participating, was conducted during the winter for gypsy moth egg masses at all the areas where moths were trapped last year. Results were negative. Larval traps were also installed at the above locations during April 1979 and thus far have been negative for this life stage of the insect.

_Imported Fire Ant:_ Fire ants were found at a greenhouse operation in Lancaster County which represents a new county record. Only three mounds were found and all were treated.

Complaints of fire ant buildup and spread, primarily within the generally infested area, were received by the county Extension offices, USDA, APHIS, the Plant Pest Regulatory Service field offices, and other agencies.

_Witchweed:_ Infestations, comprising 420 acres, were found on 32 new farms, all of which were within the current quarantine areas. A total of 9,383 acres received one or more herbicide applications for witchweed control for an aggregate of 29,278 acres treated. Ninety-two farms, comprising 1,202 acres, were released from quarantine.
Department of Seed Certification

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

The Clemson University Department of Seed Certification was designated by law in 1945 as the official agency for certifying seed and plants in South Carolina. Standards of seed certifying agencies in the United States must meet standards for certification of seed in Federal Seed Act Regulations.

Field work of the department in 1978-79 involved inspections of 71,451 acres of crops, the largest acreage ever certified in South Carolina. This work included inspections of 73 varieties of 12 crops for the 400 farmers and 31 seed-producing firms participating in the program. Each field was inspected to determine that the crop was true to variety and free of noxious weeds.

Major acreages of crops inspected in the program were soybeans (53,690), small grains (10,312) and cotton (7,145). The soybean acreage was an increase of almost 19,000 acres over 1977-78 and represents the largest acreage of any crop ever certified in South Carolina.

In addition to field inspection work, the department issued 1,418,847 tags for use on certified seed, over 400,000 more tags than issued in any previous year. Under a new program initiated to more closely monitor the quality of S. C. certified seed, 279 samples of soybeans were drawn by the department during the processing season and compared to analyses of growers' samples of the same lots of seed.

Even though weather conditions were not favorable for maximum yields in 1978-79, conditions were favorable for production of the highest germinating seed in several years. No serious problems were experienced with germinations of seed of any crop during the year. It was the first year in several that the germination standard did not have to be lowered on certified seed of some crop in order to have an adequate supply of certified seed to plant the crop.

Yields of cotton were reduced to some extent by drought in late summer of 1978 but were still reasonably good. Fall harvesting weather was ideal and as a result, seed quality was notably better than in several years. The acreage of cotton inspected was the second smallest ever for certification in South Carolina, but seed fields were generally more free of cockleburs than in recent years. More
favorable lint prices in 1978 caused a substantial increase in acreage of cotton planted for certified seed production in the fall of 1979.

Soybeans yields were also reduced to some extent by drought in late summer and early fall but turned out better than anticipated for the limited moisture available during the growing season. With the absence of conditions favorable for a build up of seed-decay organisms, germinations of virtually all certified seed samples were 90 percent or higher. With the large increase in acreage over 1977, many of the fields planted in soybeans had not been planted for seed production fields previously. As a result, many fields were contaminated with cowpeas, a most serious problem in soybeans for seed. Over 2,000 acres of soybeans were rejected because of cowpeas in the fields.

Yields of small grains for certification in 1979 were good in most areas of the State, but the diseases septoria and powdery mildew caused substantial yield losses in isolated areas. Acreage for certification was slightly over 2,000 more than in 1978, almost altogether the result of increased wheat acreage. Considerable rainfall in early June was interfering with small grain harvesting and presenting a potential threat to seed quality, but the weather pattern improved by mid June. A strong demand for seed wheat prompted by increasing prices became apparent by late June, pointing to a probable increase in acreage in the fall of 1979.
LIVESTOCK-POULTRY HEALTH DIVISION
C. E. Boyd, Director

The Livestock-Poultry Health Division conducts a number of regulatory programs in the field of consumer protection and in the area of animal health and the diagnosis of various disease problems in South Carolina livestock.

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

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

Highlights of the division's activities during 1978-79 follow:

**Meat and Poultry Inspection**

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

A total of 150 red meat and poultry plants in 39 counties are under state inspection. The full-time staff consists of seven veterinarians, 68 inspectors, a compliance-evaluation officer, and one secretary. More than 100 million pounds of red meat and poultry and almost 200 million pounds of processed meat and poultry products were inspected at state-inspected plants during the year.

**Livestock Regulatory Programs**

**Brucellosis**

This division continues to monitor dairy herds in South Carolina by the Brucellosis Ring Test four times a year and to test all replacement cattle at stockyards to prevent the introduction of brucellosis in animals imported from neighboring states.

Extensive use of two screening programs to find infected herds—Market Cattle Identification and Brucellosis Ring Test—played an important role in eradicating brucellosis in South Carolina.
Equine Infectious Anemia

The General Assembly enacted legislation effective August 1978 which requires that all horses shall be accompanied by written proof of an approved negative test for Equine Infectious Anemia when entering any public assembly of horses unless they are being moved directly to slaughter.

The Coggins Test for determining the status of each horse is being conducted by the Clemson University Animal Diagnostic Laboratory. The percentage of infection for all horses tested at the laboratory during this fiscal year is one-half of one percent.

Pseudorabies

Pseudorabies is a viral disease of swine which has become a serious problem in the Mid-west.

Provisions have been established by this division which will permit a swine breeder to maintain a Qualified Pseudorabies Negative Herd in order to alleviate the necessity of testing individual animals for out-of-state sales or other interstate movements.

Qualified Pseudorabies Negative Herd status is attained by subjecting all swine over six months of age to an official pseudorabies test and finding all swine so tested to be negative.

The status of the herd is maintained by an official pseudorabies test of 25 percent of the swine every 80-105 days and finding all swine so tested negative, but no swine are to be tested more than once in any one year in order to meet the 25 percent requirement.

There were two swine herds in Marion County infected with pseudorabies during this fiscal year.

Animal Diagnostic Laboratory

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

The laboratory is in a position to isolate and identify many diseases of animals which are impossible to differentiate clinically.

The laboratory handles more than 3,000 cases and conducts more than 200,000 laboratory tests and examinations.