1985

Annual Report of the Clemson Board of Trustees, 1984-1985

Clemson University, Board of Trustees

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1 Succeeded James M. Waddell, Jr., as Chairman of the Board July 1, 1985.
2 Succeeded Bill L. Atchley as President July 1, 1985.
3 Assumed Acting position October 9, 1985, after Melvin E. Barnette, former Vice President for Business and Finance, left the University.
4 Acting Vice President for Student Affairs while Walter T. Cox serves as President.
5 Succeeded Joseph B. McDevitt, Executive Officer and Secretary to the Board of Trustees, August 1, 1985.
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PREFACE

Thomas Green Clemson’s death on April 6, 1888, set in motion a series of events which marked the start of a new era in higher education in the State of South Carolina — especially the future of scientific higher education in agriculture and the engineering sciences.

Mr. Clemson’s passing set the stage for the founding of the University he dreamed of, with a special mission designed to improve the quality of individual lives and to lead the State toward economic prosperity in a time of economic chaos.

This unique institution, a land-grant school since its founding in 1889, bears the name of its Philadelphia-born benefactor. Its establishment hailed the beginning of a true “people’s university,” which opened the doors of higher education to all South Carolinians, rich and poor alike.

Today, almost a century after Mr. Clemson’s death, Clemson University continues true to the mission he articulated, while meeting the changing career needs of South Carolina’s young people and the general citizenry with innovative programs in teaching, research and public service.

The University is pleased to present this summary of activities for 1984-85. Clemson’s academic excellence across-the-board, as well as its recognized position of leadership in many fields, again was underscored during the year through campuswide achievements and new developments.

Even in a difficult period marked by administrative changes and other problems, financial support for Clemson’s academic programs remained as solid as ever, topping $8.9 million during the 18-month period from January 1984 to June 30, 1985. More alumni participated in giving to support academic excellence then ever before — 28 percent, which is more than twice the national average.

In other highlights, on-campus enrollment reached an all-time high in fall 1984, with 12,122 students registered for classes. Another 804 were in various off-campus programs, bringing the grand total to 12,926 — a record high for the University.

Numbers also were increasing on new high school graduates entering Clemson with advanced standing earned by means of College Board Advanced Placement courses (323 students, 3,317 credit hours). In fall 1984 the average SAT score of Clemson’s freshman class was 1,012 — the highest among state-supported schools in South Carolina. This figure compares with an average of 897 reported by the College Board for all high school seniors.

A new record was set in the College of Engineering in the amount of gifts and contributions received. Research — in terms of contract and grant awards — also established a new record. Headlining other signifi-
cant events was approval by the Commission on Higher Education of a Bioengineering Alliance between Clemson, the Medical University of South Carolina and the University of South Carolina. The Commission also authorized Clemson to establish a Center for Semiconductor Device Reliability Research, which completed its first full year of operation.

Enrollment in agriculture is declining nationwide, with projections showing a serious potential shortage in numbers of agricultural graduates in the near future. The College of Agricultural Sciences is meeting this challenge head-on with stepped-up recruiting efforts targeted at South Carolina's high schools.

The goal is to recruit the most highly qualified and motivated students into its programs at all levels. Faculty contacts with more than 50 high schools were established and maintained as a focus of intensified recruiting efforts in 1984-85.

Additional details on the year's activities in the many facets of the University are provided in the report which follows.
ACADEMICS 1984-85

Graduate School
Arnold E. Schwartz, Vice Provost and Dean

Undergraduate Studies
Jerome V. Reel, Vice Provost

College of Agricultural Sciences
Luther P. Anderson, Dean

College of Architecture
P. David Pearson, Dean

College of Commerce and Industry
Ryan C. Amacher, Dean

College of Education
James E. Matthews, Dean

College of Engineering
J. Charles Jennett, Dean

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

College of Liberal Arts
Robert A. Waller, Dean

College of Nursing
Mary Lohr, Dean

College of Sciences
Henry E. Vogel, Dean
Agricultural Instruction

Agriculture is a complex, dynamic industry encompassing far more than farming. Thus, the agricultural curricula must grow and change to prepare graduates to serve this critical industry. Clemson University instructional programs in agriculture continue to be guided by the mandate of the will of Thomas Green Clemson, "to afford thorough instruction in agriculture and the natural sciences connected therewith." This mandate assumes even greater significance considering the importance of agriculture to the State and the fact that in South Carolina only Clemson University offers curricula in agriculture leading to the bachelor's or higher degrees.

Agriculture continues to be of primary importance to the human race. Undernourishment and malnutrition remain significant, tragic issues in much of the world. Thus, the traditional role of providing food and fiber for humans and feed for domestic animals, while protecting vital natural resources, assumes growing importance. Agriculture is a major asset to our nation, accounting for about 20 percent of the nation's employment, and representing the major positive element of our foreign trade.

In South Carolina, agriculture represents an industry of more than $2 billion, divided fairly equally between production and processing and packaging. There is evidence that declines in other elements of the State's economy may be offset by growth in the food packaging/processing industry. Production and processing are recognized as high-technology, big-business fields. Students must understand and be competent in both modern technology and business to serve agriculture effectively.

To satisfy the basic instructional mission of the College of Agricultural Sciences, several curricula are available and emphasis is placed on applying principles to recognize and solve problems. This requires constant caution to avoid overemphasis on the technology, rather than the principle. All facets of instruction are constantly reviewed and revised to help ensure that students receive the most current information. Faculty members doing research supported by the South Carolina Agricultural Experiment Station bring the most recent information to their students. This must be considered one of the greatest educational benefits of the association of agricultural faculty with both teaching and research responsibilities. Research activities also make equipment and facilities available to students.

Graduate education is recognized as a responsibility of the college, and growth in this essential part of the instructional program reflects maturity of the college and of Clemson. Efforts to attract the most highly qualified and highly motivated students at all levels have been intensified in
response to projections of serious potential deficiencies in numbers of agricultural graduates in the near future.

Special instructional activities in the form of short courses, workshops and seminars are presented throughout the State to serve professionals and help maintain and improve their level of technical competency. International agriculture is recognized as an area of responsibility, and this is served through programs at Clemson and abroad.

Agriculture faces the most severe economic crises. Help is essential, and much of the help will depend on current students as they graduate and enter careers.

Nationwide, enrollments in agriculture continue to decline in spite of well-documented need for graduates. The reasons for this decline are many and vague. Among these are the poor image many have of agriculture as a career field, the continuing decline of the traditional rural population as a source of students, and the nearly catastrophic economic circumstances of some farmers.

The College of Agricultural Sciences has stressed recruiting qualified applicants for several years. In 1984-85, the enrollment decline seems to have reversed, but freshman enrollment is still more than 25 percent lower than the 1978 peak. Preliminary figures for 1985-86 indicate an increase in admissions, but not a major increase in total applications. They suggest that recruiting activities have at least attracted quality students.

The recruiting efforts of the college have centered on direct high school visits by faculty. During the 1984-85 school year, contacts were established and maintained with more than 50 high schools in the State. In addition, several special programs were offered for guidance counselors and other administrators, as well as for parents and prospective students. Private funds have been raised for much of this effort.

Practical and business experience is still sought by employers. The growing internship program provides students with experience. In some areas there are more internship opportunities than students to fill them.

Affirmative action efforts also have been linked to both recruiting and internships. The college has had grants through the U. S. Department of Agriculture to support minority internship students. These and similar grant funds have provided critical support for minority recruiting efforts.

The success of the instructional programs can be measured in several ways. Although enrollment is low, demand for graduates is high. Placement of graduates has been excellent in all curricula.

In addition, scholarship support of undergraduates is exceptional. Collegewide, 110 scholarships with a value of more than $75,000 are associated with specific departments.

During 1984-85, several significant steps were made in curriculum development. In addition to the ongoing review of all curricula, a proposal for the Ph.D. in food technology was finalized, approved by the
faculty and is now moving through channels for authorization. In addition, in May 1985, the faculty approved three new curricula — bachelor's and master of science programs in packaging science and a curriculum in integrated pest management (IPM) to be offered under the Master of Agriculture program. Each of these reflects the growth and changes in agriculture in South Carolina and the world.

**International Agriculture**

The College of Agricultural Sciences maintains services to agriculture in several areas. During the 1984-85 academic year, six undergraduate and 33 graduate students were enrolled in degree programs.

Additionally, the college has hosted more than 30 foreign visitors whose stay varied from a few hours to several months, and has cooperated with the Office of the Commissioner of Agriculture in an international program through the Governor's Office. Several formal programs through the Southeastern Consortium for International Development have been completed (for example, the program in the Seychelles Islands) and new programs are emerging. These include a plant pathology/horticulture program in tree fruits with an Egyptian university and the agromedicine program led by the Medical University of South Carolina.

**Continuing Education**

Continuing education activities sponsored by the College of Agricultural Sciences serve a widely dispersed and diverse clientele. Extension Service personnel, farmers, home gardeners, pesticide operators and consultants are but a small sample of persons attending a wide variety of short courses, schools, conferences, seminars and workshops sponsored by the college.

Such programs, tours and field days are offered on campus, at branch Experiment Stations and other locations throughout the State.
Following a careful search in which the professional and academic communities participated, Dr. Paul David Pearson was installed as dean of the college in August 1984. He expressed his promise and commitment to excellence in design education in opening remarks to the faculty at the start of the academic year.

Outlining a multi-faceted approach, Dean Pearson promised to recognize and nurture each of the four departments and the academic programs they operate. He also pledged to seek increased national recognition for the college and its faculty through expanded participation in professional activity, and to identify new sources of support for the high demand areas of computer-aided design and computer graphics, research/grant participation, and increased professional involvement for the teaching staff of each department.

**College Programs**

The long established tradition of college enrichment by the Clemson Architectural Foundation allowed the community to experience one of the most comprehensive lecture series of architectural/environmental/artistic professionals ever held in South Carolina. Professor Frederick Roth guided the lecture series, which brought 13 speakers of national and international prominence to our rostrum.

- Professor David Hicks spoke on "The Vernacular Architecture of the High Atlas Mountains, Morocco."
- Alfred Rowe lectured on "The Unique Architecture of Sir Edwin Landseer Lutyens."
- Ofelia Garcia detailed her participation as juror and critic in the curatorial world.
- Drs. Suzanne and Henry Lennard had a co-commentary on "Public Life in Urban Spaces."
- Dean Pearson brought to light some recent scholarship via two lectures, "Hollywood's Architects" and "The Development of Women as Architects in Finland."

Other lecturers included: Adele Santos, chairperson of the Department of Architecture at the University of Pennsylvania; Howard Fox, associate curator of exhibitions at the Hirshhorn Museum in Washington, D.C.; Harvey Gantt, architect and mayor of the city of Charlotte, N.C.; Gary Siebein, professor at the University of Florida; Stanford Anderson, professor of history and architecture at MIT; and J. William Rudd, head of the Architectural School at Washington State University.

Sheila Hicks, internationally prominent tapestry artist, lectured on her own work, giving the spring component of the program a rich and
interdisciplinary profile, and at the conclusion, Edmund Bacon offered his own commentary on the "Future of Cities."

These events in many cases were coordinated with other college programs such as gallery exhibitions and were open to the public as well as to the professional community.

The Lee Hall Gallery exhibition schedule began in September with the architectural show "Precursors of Post-Modernism" and continued with the annual exhibition of recent works by the Visual Arts faculty. The Southeast Women's Caucus for Art Annual Show, juried and held at the Lee Hall Gallery, provided a major chance to see an emerging cross-section of women artists in our region. The autumn term of exhibitions ended with student terminal project reviews and Master of Fine Arts theses exhibitions. The winter-spring schedule commenced with Robert Stackhouse's Sculpture and Drawing Exhibition and Gunars Strazdins' Drawing Exhibition.

The major artistic event in the Gallery was the jury and exhibition of the Clemson National Print and Drawing Show held February 11-March 4. The concluding exhibitions — Professor Ireland Regnier's Paintings and Drawings, Southern Photography and a special drawing exhibition on Pioneering Women in Finnish Architecture — rounded out the professional activities held in Lee Hall Gallery.

Three special events during the year related to the activity of faculty and administrators. Most significant of these was the closing reception of the faculty art show on September 22, which was coordinated with an open house for the Visual Arts faculty studios. This event was a special opportunity to educate our peers on campus and in the State and community about the Visual Arts and History Department's special mission and its value to the region.

Within the same month, Professor John Acorn, head of the Department of Visual Arts and History, and Dean Pearson traveled to Rome, Italy, to participate in the opening of a special regional exhibition entitled "A Picture of the South." Twenty-five percent of the artists representing the State of South Carolina were Clemson University faculty and MFA graduates. The event, recorded in all the major Italian newspapers, was the first international recognition of Clemson University's visual arts program at that level.

Dean Pearson and the head of the Department of Architectural Studies Kenneth Russo traveled to Washington, D.C., to participate in the Administrator's Conference of the Association of Collegiate Schools of Architecture. The three-day conference provided a chance to compare Clemson's educational program with others in this area. For example, more than 28 overseas programs are now operated by member colleges of the ACSA community, which stand together to serve as a base for intercollege sharing of foreign study in the future.
The final special event of the academic year, Honors and Awards Day, was held in the William G. Lyles Memorial Auditorium in Lee Hall. The guest speaker was Maj. Gen. Clifton D. Wright, Jr., of Washington, D.C., a Clemson alumnus, who delivered an address on the pursuit of excellence in architecture in an environmental career.

New Developments

In the study performed at the beginning of Dean Pearson's leadership, deficiencies were identified in the areas of computer equipment, physical facilities, high level administrative support and professional interface with national organizations. Work throughout the year was directed at correcting these deficiencies.

In the area of computer equipment and instruction, Dean Pearson met several major U.S. architectural practitioners currently using the most advanced computer techniques, which led to decisions to procure hardware and software to advance Clemson's use of computer-aided graphics. Also, permission was granted to add a faculty professional qualified in interdisciplinary computer applications.

With respect to facilities, the study revealed inadequate housing for departmental support staff and college operations. Professor John Jacques proposed a package that will, when in place, provide a progressive and modernized facility for college and departmental operation. A computer terminal network and control system, consisting of seven terminals and a printer, was installed to modernize administrative processes.

In the area of administrative development, need and efficiency mandated that high professional support be integrated into the administrative core of college leadership. An administrative assistant position was added to the staff along with an accounting technician. These additional positions have been helpful in areas of management, planning, purchasing and budgeting.

In programming the college's action with international, national and regional organizations, Dean Pearson appealed to the faculty to devote some of their extracurricular time to participating in symposia and presentation of their own intellectual involvement. Faculty members participated in:

- The South Atlantic Regional Conference and the S.C. State Chapter of the American Institute of Architects, Asheville, N.C., September 1984; Dean Pearson, Gayland Witherspoon, Harlan McClure and Joseph Young.
- The annual S.C. Chapter of the American Institute of Architects and the Clemson Architectural Foundation, Charleston, S.C., March 1985; Dean Pearson, faculty and the entire student body of third year design, Professors Ralph Knowland, Gayland Witherspoon, Joseph Young, Richard Norman, Harlan McClure, Gordon Patterson, Don
Collins, Frederick Roth and JoAnn Moncure.

- The Association of Collegiate Schools of Architecture, Southeast Regional Meeting, Atlanta, Ga.; faculty from the Architectural Studies Department headed by Dean Pearson and Professor Knowland.
- At the annual meeting of ACSA, Vancouver, Professor Richard Norman delivered a paper on computer color graphics; Professors Young, McClure and Dean Pearson.
- The ACSA teacher seminar, Cranbrook Academy; Professor Gerald Walker.
- The Society of Architectural Historians Annual Conference, Pittsburgh, Pa., April 1985; Professors Harold Cooledge, Cecilia Voelker, Richard Norman and David Pearson. Professor Norman and the dean also visited the computer facilities at Carnegie Mellon Institute and interviewed the leadership of that program with respect to academic computer use in architectural education.
- The National Convention, AIA, San Francisco, Calif., June 1985; sixth year and fourth year students headed by Rutledge Workman, president of ASC/AIA, Professor Witherspoon and Dean Pearson.

Dean Pearson also participated in an Alvar Aalto symposium in October and delivered invited lectures at the American Institute of Architects National Headquarters in February, Washington State University in Pullman, Wash., in March, and at the University of South Carolina at Aiken in June.

Teaching, Research and Faculty Honors

Throughout the academic year, members of the four departments exerted significant energy and demonstrated expertise within their developed specialties. Activities of the faculty of the Architectural Studies Department included the execution of public service projects for the Charleston County Courthouse, First Presbyterian Church of Clemson, the Atlanta/Fulton County Justice Center and the Columbia-Congaree Vista Redevelopment Study. The Health Care Facilities programs for a Cooperative-Care-Environment for the Memory Impaired in Greenville, S. C., and Lexington-Richland County Alcohol and Drug Detoxification Center are only a few of the specialized programs executed under public service assistance.

Individual faculty made significant contributions during the year. Professor Don Collins attended “Microcomputers for Landscape Architects” sponsored by ASLA in Atlanta, Ga., completed a South Carolina Fire Academy’s bank of qualifications certification, and the master planning for Cedar Mountain, North Carolina property. Professor Collins also completed a new office building for a travel agency in Clemson.

Professor Lynn Craig organized the entire year at the Charles E. Daniel Center for Building Research and Urban Study in Genoa, Italy. Special
events included travel within Europe and side trips to Leningrad and Moscow. Professor Martin Davis lectured at the Architectural Association School in London, England, at an energy program and published a paper on "Reuben Harrison Hunt and the Eclectic Movement of Architecture in the South."

Professor Yuji Kishimoto delivered a paper at the Urban Design Conference in Boulder, Colo., in September and lectured on "Urban Rhythm" for the Columbia Council of Architects in March. Professor Harlan McClure was the graduation speaker at Mississippi State University in June and lectured at the North Carolina Conference on Art Center Programming and Design in Durham, N. C. Professor Kenneth Russo was selected to be the 1985-86 Professor-in-Residence at the Charles E. Daniel Center in Genoa, Italy.

Faculty activity of the Visual Arts and History Department included attendance by Professor Janet Mulholland at the College Art Association in Los Angeles, Calif.; Professor Cecila Voelker's presentation of papers at two international conferences on San Carlo Borromeo's Influence on Sacred Art and Architecture in Milan, Italy, and Washington, D. C.; and Professor Ireland Regnier's participation in an interdisciplinary project sponsored by the Kellogg Foundation.

Individual accomplishments by professors within this department included Robert Hunter's paintings and prints purchased by the IBM Corporation and the MCI Corporation in Rye, N. Y., for their permanent collection. Professor Sydney Cross' work was selected for the Pyramid Art Center in Rochester, N. Y., and Professor Sam Wang's photographs selected for the exhibition "Southern Landscape Photographers."

The Planning Studies Department, in its continuing efforts to benefit public service in the State and region, first under Professor Edward L. Falk and then under Acting Head Jose R. Caban, jointly participated in the State water policy study for the Strom Thurmond Institute at Clemson. Professor Barry Nocks, on a special leave of absence, was invited to join the Alpha Center in Washington, D. C., to contribute two monographs in the fields of health planning and policy analysis. Professor Olgun Ersenkal departed on a leave of absence to administer a large scale regional development project in Turkey with World Bank and United Nations sponsorship.

Individual efforts in service areas were as follows: Jose Caban concluded the last phase of an eight-year consulting link with the city of San Juan, Puerto Rico; Professors Phillips Hungerford and James London executed a physical design and economic feasibility analysis for the Reedy River area in Greenville, S. C.; and Professor Edward Falk prepared, with graduate student assistants, a survey and analysis of projects for industrial growth for the city of Clemson.

In the Department of Building Science, significant activity involved
the drafting of the Master of Building Science program to be presented for approval within the next academic year. A "Letter of Intent" was sent to CHE this year, and the program promises to be a major addition to the college’s educational repertoire.

A special Honor’s Day activity included a celebration banquet calling attention to the extraordinary growth of the Building Science Department. In the area of professional development, the Building Science Department, through the efforts of its head, Professor Ralph Knowland, has managed to create and establish a standing committee of advisers from the building industry and professionals. They will continue to provide counsel and support for this vital program.

Especially noteworthy achievements in this department follow. Professor Anders Kaufmann attended the Annual Meeting of the National Trust for Historic Preservation in Baltimore, Md. Professor Clarence Addison attended the Construction Industry Seminar in Charlotte, N. C., the AGC Task Force Meeting in San Diego, Calif., the National Convention of the Associated General Contractors of America in San Francisco, Calif., and the "Computers in Design Education" seminar in Anaheim, Calif. Professor Roger Liska presented a report at the mid-year board meeting of the American Council for Construction Education in Kansas City, Mo., attended the Executive Committee meeting of the American Institute of Constructors in Atlanta on December 14, and represented the department at the ASC and AIC annual meetings held in Tempe, Ariz., April 9-12.


During this academic year, faculty honors and awards primarily centered in the area of promotion and internal development. Professor Janet Mulholland was awarded a sabbatical leave to pursue research in art history and archaeology in Scotland. Professors Barry Nocks, Jose Caban and Tom Dimond were awarded tenure. Professors James Stockham, Tom Dimond and Clarence Addison were promoted to the rank of associate professor, and Professor John Jacques was promoted to the rank of professor. Dean Pearson received the Bruner Fellowship from the American Institute of Architects New York Chapter. Professor Gayland Witherspoon was elected secretary/treasurer of the South Carolina Chapter of the AIA. Professors Frederick Roth, Edward Falk and Hugh Webb retired from the faculty at the end of the academic year. Search processes
were successfully concluded with excellent replacements of those teaching positions.

Notable among the student achievements are the 1985 National Outstanding Student Project Award by the American Planning Association, which awarded funding of $10,000 for the Allendale Community Development Study under the direction of Professor Barry Nocks.

Thad Crowe, a second year planning student, received the 1984 Bell Memorial Scholarship. Mark Simmons received the 1985 American Institute of Certified Planners' Award. James Golden was awarded the Alumni-Faculty Award. Josephine Moncure was awarded the AIA School Award. Joeb Moore was awarded the AIA Medal and First Student Award.
COLLEGE OF COMMERCE AND INDUSTRY

The College of Commerce and Industry comprises the School of Accountancy, the School of Business and the School of Textiles. The college is also responsible for the Office of Professional Development and the Small Business Development Center, separate entities reporting directly to the dean.

The School of Accountancy offers a traditional undergraduate curriculum in accounting as well as a master's in accountancy.

The School of Textiles pays special attention to textile programs with an emphasis on business. The school began accepting students into its new textile management program in fall 1983.

The School of Business focuses on traditional business fields: economics, finance, marketing and management. The school's curricula are designed to prepare students for a variety of careers as well as to furnish an education on which to build for a lifetime. The curricula recognize the need for an understanding and appreciation of the nature of human interaction and the comprehension of the economic, political and social environment.

The School of Business

Department of Economics

Economics at Clemson University is steadily building a national reputation in applied research and teaching. The primary responsibility of the department is teaching, but in a scientific discipline, this responsibility can only be discharged properly by knowing the frontiers of knowledge. Our credentials are our research output.

Over the past academic year, the department has published repeatedly in the top economics journals. All told, more than 30 journal articles, 10 notes, 20 monographs and contributed chapters, and five books and edited volumes were published by the faculty. The applied focus of our research shows up in the product: Over the year, topics studied included the financial effects of mergers, the effect of labor market size on discriminatory wages, the effect of environmental laws on capital turnover in electrical utilities, and cost analyses of air frame acquisitions by government.

Two conferences were sponsored through the Center for Policy Studies, which hosted nationally prominent figures in economics. The first was a conference on bureaucracy, and the participants were all current or former bureaucrats trained in economics. Our department supplied three to the list: Bruce Yandle, alumni professor and former executive director of the Federal Trade Commission, Daniel Benjamin, who just joined our staff from a two-year stay at the Department of Labor, and Roger Meiners, director of the Center and former director of the Atlanta branch
of the FTC. The second conference, supported by the Liberty Fund, was hosted by Yandle and Richard McKenzie. It featured lectures by Armen Alchian, Michael Novak and Alan Schwartz. The participants were primarily teachers from small colleges in the tri-state region.

Benjamin joined the Clemson faculty this summer as a full professor. He is best known for his work on interwar unemployment in Great Britain in which he showed that the unemployment compensation scheme itself was primarily responsible for the problem. This finding has elicited a heated debate that still rages because it undermines the basic motivation of the Keynesian revolution. Curtis Simon joined the faculty in the fall as an assistant professor. Simon's research interests are in unemployment and urban industrial diversity.

The Ph.D. in Applied Economics, jointly administered with Agricultural Economics, was restructured last year to allow students flexibility in choosing their fields of concentration and to improve their training in the core areas of economic theory and econometrics. The master's program continues to offer a vehicle to Clemson students who want more training in economics before they begin their careers. Many decide that a year is not enough and choose to pursue a Ph.D. Over the past year, the department developed master's program concentrations in business economics and operations research.

Department of Finance

Some 1,593 students were taught by the Department of Finance this past year, 30.5 percent more than in the preceding year. We also had nearly 600 financial management majors at the close of the year, the second largest group in the college. We continued to turn out high-quality undergraduate students and are proud of our students' success in the job market. The support of regional businesses that hire our students has been overwhelming.

The research output of the faculty increased dramatically during the year as well. Every faculty member published one or more articles or wrote grant proposals and received funding for specific research projects. Stacy Sirmans was on leave with the Office of Policy and Economic Research at the Federal Home Loan Bank Board in Washington. He had a very successful year writing policy statements for the board and publishing five articles in major academic journals. Rodney Mabry, who joined the department as its first head last fall, published four articles on wide-ranging topics such as property and casualty insurance, state and local government expenditure categories, and gains in federal funding by the Snowbelt states relative to the Sunbelt states in the 1970s. Perry Woodside and Don Wiggins joined forces to propose a research project to the Strom Thurmond Institute that involves developing a general model for the financial evaluation of the management of public water systems in South
Carolina. This is a significant project that will last two to three years and will bring in major funding.

During the year, two new faculty were recruited. William A. Kelly, Jr., comes to us from Pennsylvania State University and will be associate professor of finance. He earned his Ph.D. at the University of North Carolina at Chapel Hill and has research interests in corporate finance, index financial contracts and alternative mortgage instruments. Mike Walsh is joining us as a visiting assistant professor. He is completing his doctorate at the University of Georgia and has research interests in investments, real estate finance and microeconomic theory. Other faculty changes include the return of Stacy Sirmans from leave and the departure of Paul Mason and Don Wiggins.

Goals of the Finance Department for the coming year include: development of a Master of Science program in finance, development of a degree program in financial planning, expansion of our present undergraduate curriculum by offering more concentrations, and continued emphasis on faculty research. A master’s level program in finance is needed because there is no such program in the State and because the increasing complexity of financial transactions and opportunities has created a demand for such a program. At the undergraduate level, the current financial management program is being revised to offer students several options for emphasis in corporate finance, banking/financial institutions, real estate and risk management/insurance. Plans are already under way to propose a financial planning major to draw together the traditional expertise in investments, insurance and real estate to produce individuals prepared to become Certified Financial Planners and take positions in the trust departments of banks, insurance firms and in separate financial planning enterprises. Finally, faculty will continue to expand their individual research programs and become even more involved in theoretical as well as practical research for business.

Department of Management

The department is making substantial progress in pursuing its two primary goals of teaching and research. In teaching, the department continues to offer the most popular undergraduate degree program on campus, the B.S. in administrative management. More students are enrolled in this B.S. program than any other on the campus. In addition to the B.S. in administrative management, there is a B.S. in industrial management that focuses on the production/operation side of industry. Industrial management also offers an M.S. and a Ph.D. Since the Ph.D. in industrial management was transformed from a Ph.D. in engineering management in summer 1982, enrollment in that program has grown substantially, as the following numbers attest.
1984-85 Enrollment:

- Undergraduate ............................................. 1,133
- Graduate Resident ........................................ 78
- Clemson at Furman MBA* .................................. 173

TOTAL ......................................................... 1,384

Degrees Awarded by Type:

- Bachelor of Science ......................................... 293
- Master of Science ........................................... 23
- Master of Business Administration* ........................ 46
- Doctor of Philosophy ........................................ 2

TOTAL ......................................................... 364

* Taught and administered by Furman University

Additionally, the total number of students taught by the department increased about 5 percent last year, reflecting the growing number of students in other degree programs who are interested in management issues.

The department recruited four new faculty during the academic year. Steve Taylor from Virginia Polytechnic Institute has joined us in the area of personnel; Steve Davis from Georgia Tech in management information systems; Barbara Spencer from Virginia Polytechnic Institute in strategic management; and Joe Ward from the Air Force Human Resource Lab in management science.

Research in the department picked up last year, a reflection of the increased number of Ph.D. students working on dissertations with faculty, the increased number of journal articles and research monographs published by the faculty, and grants received in the department over the past year.

To help increase the relevance of our programs, the department worked with its Industrial Advisory Board consisting of 13 industry executives. Two of the member firms funded scholarships — International Envelope Co. and NCNB. At the suggestion of the board, the first annual career fair for business students only was held. A Speaker’s Bureau also was started in which executives guest lectured in the classroom. In response to the first telephone solicitation of management alumni, the alumni donated funds to establish the first management alumni scholarship.

Department of Marketing

The 1984-85 academic year was the third year of operation for the Department of Marketing. Enrollments continue to grow as students become increasingly aware of the excellent career opportunities in marketing. More firms are recognizing that Clemson produces graduates with
a marketing background and, as a result, are increasing their recruiting at Clemson.

During the fall semester, one of our 1984 graduates returned to campus with several of her colleagues from Proctor and Gamble to talk with students about marketing and opportunities in their organization and to offer advice about preparing for marketing careers.

During this past year, some of our students conducted a marketing audit for WSBF, the Clemson University radio station. The station was concerned about the way it was being received. The students, after two semesters of research, provided comprehensive recommendations for the station to better its capabilities in serving the University and local community.

A course in international marketing was offered for the first time during the spring of 1985. This course was received with enthusiasm and a capacity enrollment. The courses in sales management and retailing, in their second year, continue to be well received by students seeking career-oriented courses.

The faculty’s research efforts have gained wide acceptance by professional associations and journals. This success increases recognition of our department by colleges, universities and businesses across the nation.

School of Accountancy

Since the creation of the School of Accountancy in December 1981, work on the Master of Accountancy program has been completed. During 1982-83, the first students were admitted. Although the program was initially started with on-campus courses, it expanded in the summer of 1983 to Greenville Technical College where selected courses are offered at night. Interest in the new professional program continued to be strong throughout the year, and by the summer term, enrollment exceeded 20 students. The first students were graduated in May 1984.

The undergraduate program continued to be strong during the year. Although total accounting majors remained the same as the prior year, the demand for accounting courses increased approximately 3 percent because accounting majors took more electives in accounting to strengthen their basic accounting knowledge. Also, as the overall job market tightened, students in other majors sought accounting courses as areas of minor concentration. During the fall term, more than 2,100 students were enrolled in accounting courses.

The fund drive for the professional program begun in 1981 continued. Contributions and pledges have exceeded $100,000. These funds have been earmarked for such areas as the development of the professional program, increased library holdings, faculty development, microcomputer acquisitions, and student recruiting and placement. Although the
funds were received and pledged from many sources, the major commitment was made by CPA firms.

To begin the year, the school hired one new faculty member in the area of information systems. This addition kept our faculty positions at 21, 19 of which are permanent.

The major effort in student activities was the second year of our Beta Alpha Psi chapter. Beta Alpha Psi is the national honorary fraternity that admits students who meet minimum grade requirements and have at least junior standing. The Accounting Club was also very successful, with emphasis placed on freshmen and sophomores rather than upperclassmen.

School of Textiles

The basic mission of the School of Textiles includes providing technically oriented candidates for future leadership positions in the textile industry, keeping on the forefront of scientific and technological innovations relevant to textile materials and processes, and counseling both industry and the public through the textile knowledge and facilities available at Clemson University. The past year has been a period of marked change in the American textile industry and may prove to be a focal point of technological transition as well as adaptation to technological changes in both manufacturing and marketing.

Over the past decade, textile firms have invested more than $10 billion in various modernization programs. Many of these programs came together during 1985 and resulted in dramatic productivity improvements and demonstrated need for more sophisticated technical management. It appears that a key for successful textile leadership of the future will involve the ability to recognize the need for technological change, master the elements necessary to bring the change about, and implement technological innovation rapidly.

The School of Textiles is prepared to deal with technological changes that are anticipated to impact the textile industry of the future. During the past year, all courses in a new curriculum in textile management were taught for the first time, and two students graduated with B.S. degrees in the area. Prospects for the future of this program are extremely promising. Through the good work of a strong recruiting effort, freshman enrollment in textiles is at the highest level in nearly 30 years. Employment opportunities for textile undergraduate and graduate majors are abundant, and starting salary levels are among the highest of any major in the University.
actively involved in some 30 continuing education programs.

In the area of public service, textile faculty are called upon by representatives of industrial firms throughout South Carolina and the nation seeking solutions to textile manufacturing, materials and applications problems. This activity involves up to 30 percent of several faculty members’ time and results in extensive visitation by industry to our laboratories and by our faculty to manufacturing facilities. A direct benefit of this work is the exposure of industry professionals to Clemson University and the initiation of exploratory research, which often expands into extensive research funding.

Through a breadth of activities in teaching, research and service, the School of Textiles provides balanced support to the principal mission of Clemson University. In order to continue at the present level of effectiveness in leading and responding to the technological changes impacting textile disciplines, the need for significantly greater facility and program support is anticipated. During the 1985-86 academic year, studies of faculty, staff, program and facility planning will be undertaken to articulate the most feasible means by which Clemson can maintain continued textile leadership.

Office of Professional Development

The Office of Professional Development is South Carolina’s largest provider of continuing professional education for business and industry according to 1984 enrollment figures. During 1984, in excess of 18,850 people from throughout the Southeast, across the nation and overseas attended more than 630 Professional Development seminars, conferences, short courses and in-plant presentations. These figures represent steady, healthy increases in the number of individuals per course served by the Office of Professional Development. This ever-growing increase in service has been achieved — following long-standing Professional Development policy — at no cost to South Carolina taxpayers; all Professional Development programs are self-sustaining.

Textile Conferences

Professional Development offers a wide selection of programs geared to the needs of the textile industry, ranging from one-day workshops to two- and three-day technical conferences to the intensive, comprehensive two-week “Textile Leadership for Tomorrow” executive development program. These conferences, bringing together leading industry experts and textile faculty from Clemson, N. C. State and other top research institutions, provide regular up-to-the-minute updates on textile technology and process developments for textile managers, supervisors and executives from throughout North America, Europe and the world. New conferences are continually developed in response to new opportunities.
and difficulties facing the textile industry. In 1984, 37 textile conferences on topics ranging from basic processes to advanced process and equipment applications drew more than 2,175 textile executives and managers — an increase of more than 31 percent over previous years’ figures. The number of programs also increased, with five programs (Electronics in Textiles, Industrial Fabrics, Carbon and Graphite Fibers and Fabrics, The Nonwoven Fabrics Forum, and Employee Involvement) attracting more than 100 participants each.

The One-Day Management Series

Professional Development entered the one-day management seminar market in the fall of 1982 in response to the needs of Southeastern business and industry for economical training alternatives. Since then, more than 31,622 people from thousands of businesses, industries, agencies and organizations have taken advantage of this low-cost, high-quality training option. Each of these seminars covers one of 30 or more topics in a compact seven-hour format and is presented in any one of 41 major cities throughout the Mid-Atlantic, Southeast and South Central regions. These seminars offer business people the opportunity to attend quality training programs as easily as they might commute to their own jobs, with no added travel or accommodation expenses.

In-Depth Management Programs

Professional Development also presents a comprehensive series of two- and three-day programs covering vital management topics such as productivity improvement, quality control, computer applications, purchasing, inventory, maintenance, marketing, construction cost estimating and employee involvement. These programs provide in-depth reviews and updates on the continuously evolving progress of American management theory, technique, style, philosophy and practice. Always presented with application in mind, these programs are designed to guide and propel the ongoing economic advancement of the booming Southeast Sunbelt, as well as that of the entire nation.

Hands-On Computer Seminars

In the spring of 1984, in response to a growing demand for computer competency at all levels of management, Professional Development initiated a comprehensive series on computer software packages, featuring hands-on training on the most widely used personal computer of our time, the IBM PC. Still in the beginning stages, this series, which emphasizes Lotus 1-2-3, dBase II and III, Symphony and advanced courses in all three subjects, has attracted more than 1,300 participants in seven major cities. A course on learning how to use the IBM PC itself has proven to be a major attraction throughout the Southeast. In addition, our instructors
have gained such wide acclaim that many course participants have requested special "in-plant" sessions strictly for their company personnel.

In-Plant Programs

In recent years, the "in-plant" or "in-company" training program — in which an entire seminar, complete with instructor, materials and support staff is brought to a company's own facility — has become tremendously popular among cost-conscious training managers. Professional Development, one of the Southeast's pioneers in the in-plant field, doubled its in-plant presentations in 1984 over the previous year, conducting more than 100 of these "any topic, anywhere, any time" programs for the benefit of more than 1,465 participants. From leading Fortune 500 corporations to fast-growing new entrepreneurs, from the Department of Defense and NASA to the Boy Scouts, Professional Development has brought and continues to bring state-of-the-art training where it's needed, when it's needed, in the form in which the customer needs it most.

Special Events

Whenever new developments create new needs and opportunities, Professional Development responds with "Special Events" programs designed to meet needs unmet by its more conventional offerings. When women began to make an impact on executive positions in the Southeast, Professional Development responded with its pioneering "Professional Development for Women" workshop, which continues to draw upwards of 300 business and professional women each spring.

When In Search of Excellence topped the nonfiction best-seller list, Professional Development responded by bringing top McKinsey & Company executives here for an executive briefing on the decade's most talked-about book. When Dr. Terry Deal took those ideas to the heart of the matter in his book, Corporate Cultures, Professional Development sent Dr. Deal himself on a four-city, Washington-to-Fort Lauderdale series of executive briefings.

When the textile industry's concern with Washington's response to the textile-imports issue became increasingly urgent, Professional Development took a group of industry executives straight to the source with its "Textile Briefing on Capitol Hill." And when U. S. Tariff Schedule 807 and the Caribbean Basin Initiative caught the eye of many textile executives as an alternative means of competing with imports, Professional Development formulated a comprehensive program in Barbados entitled "Offshore Assembly" to explore that alternative.

These and other special programs underline Professional Development's ongoing commitment to meeting the needs of its constituency, even when it means breaking new ground, forging ahead in unprecedented directions.
International Outreach Programs

Professional Development’s mission today reaches around the world to give American executives a first-hand look at their overseas counterparts, and to bring American managerial and technical expertise to those who want and need it. For instance in September 1984, Professional Development took a group of 42 American textile executives on a two-week fact-finding mission to China, where, as invited guests of that country’s highest textile official, Zhang Hui-Fa, the delegation toured several Shanghai textile mills and visited points of worldwide interest near Beijing. A similar trip, which includes a stop in Hong Kong, is planned for September 1985.

Also for the first time, Professional Development formulated “An Executive Investigation into Offshore Assembly” for textile executives to evaluate U.S. government tariff incentives created to attract U.S. investors to the Caribbean islands. More than 50 textile executives attended, thus stimulating Professional Development to schedule another “investigation” next year in Jamaica. Another textile outreach program, “The World Wool Outlook,” was planned for Australia and New Zealand in November, while others were in the planning stages for Japan and possibly Brazil.

Meanwhile, Professional Development is cultivating strong, ongoing relationships with the world’s second largest textile firm, Courtaulds of Great Britain. Professional Development has presented three two-week comprehensive training programs (“Fortnights at Clemson”) for Courtaulds and has presented extended training sessions at Courtaulds’ Manchester (UK) headquarters.

In 1984, Professional Development also conducted a wide-ranging training effort for officials of CATGO, the international cotton arbitration and testing organization, who came from CATGO headquarters in Cairo to attend. In addition, the United States Department of State sought out Professional Development to present a series of management training programs for Embassy personnel in Costa Rica.

Small Business Development Center

The Small Business Development Center of South Carolina, a consortium of four universities, was founded for the purpose of helping small businesses succeed. During 1984, the consortium conducted 161 continuing education courses attended by approximately 3,500 small business persons. In addition, more than 1,500 clients throughout South Carolina made use of the consulting services.

The Clemson Basic Service Center serves 11 counties through its main office in Sirmine Hall and its three satellite offices located at the University of South Carolina-Spartanburg, Lander College in Greenwood and Greenville City Hall. Services offered include consulting and continuing
education in all aspects of business, including marketing research, financing, business start-ups, recordkeeping and general management advice. During 1984, the Clemson center conducted 51 seminars attended by nearly 1,000 participants and provided one-on-one consultation to more than 500 small business clients.
As one of four institutions in South Carolina with nationally accredited teacher education programs at the undergraduate and graduate levels, Clemson has renewed its commitment to excellence in the teacher preparation field. As a result of the attention recently focused on the teaching profession, education today has a high priority at the local, state and national levels. Clemson’s College of Education offers a variety of programs designed to prepare students to meet the growing demand for competent teachers and professional service personnel for schools from the kindergarten through the university levels. The college is the State’s major producer of math, science and vocational teachers. The college also offers an excellent graphic communications program that prepares students for professional careers in the printing/publishing/packaging industries.

During 1984-85, the College of Education conducted numerous research and service programs aimed at attracting the State’s brightest students to teaching careers, improving the quality of graduates entering the teaching profession, and expanding the opportunities and enhancing the capabilities of those already in the profession. The college also launched a series of program analyses that will lead to comprehensive evaluations in the coming months by national, state and university groups. These evaluation activities reflect the increased level of accountability demanded by the education improvement movement.

**Instruction**

Clemson’s teacher preparation programs have long stressed in-depth study in subjects to be taught and extensive practical experience in the laboratory and in the field. During 1984-85, approximately 1,600 placements of various types were made in our laboratory-centered teacher preparation programs. Placements ranged from full-day, 12-week student teaching to the tutoring of individual children.

The Learning Resource Microcomputer Lab operated on a 12-hour daily schedule to help students upgrade their basic skills. The program served approximately 150 students per week. Graduate and undergraduate classes also used this laboratory for “hands-on” instruction in the educational applications of computers.

During 1984-85, the Godfrey Hall renovation planning committee developed plans for several laboratories. Those plans have been approved by State officials and have been sent out to building contractors for bids. Construction on the renovation project is scheduled to begin in early fall 1985. When completed in 1987, the newly renovated Godfrey Hall will be devoted primarily to instructional programs for the Department of Industrial Education. The plans include laboratories for drafting, electricity/
electronics, graphic communications (basic), graphic communications (advanced), printing (offset, gravure, flexography, screen, etc.), photography, micro-teaching, industrial training and instructional resources. Godfrey Hall provides laboratories on the lower level for arts and crafts, plastics and power technology. These laboratories will not require additional renovation.

**In-Service**

During 1984-85, the College of Education offered 84 off-campus courses at 40 locations throughout the State. Enrollment in these courses was 1,295. Also, 34 courses in mathematics, science and computer education were taught with funds from the State Department of Education; 582 teachers were enrolled in these courses.

During the year, the ComputerVantage program participated in a variety of activities including:

- Teaching graduate classes;
- Conducting in-service sessions for school districts (12);
- Making presentations in graduate and undergraduate classes;
- Participation in Senior Citizens Week;
- Participation in Piedmont Reading Council;
- Participation in Macintosh Day for students, faculty and staff;
- Participation in Celanese Fibers Company Picnic;
- Presentation at S. C. Convention of the Council for Exceptional Children.

**Research and Grants**

During 1984-85, the Industrial Education faculty obtained donations of equipment and supplies valued at more than $300,000. Some of the equipment is in storage and will be used in renovated Godfrey Hall labs. Several of the supply items were in large quantities and will be useful to the instructional program during the next three to five years.

An equipment grant from AT&T provided computer graphics and related items to support research being conducted in media development and for the doctoral studies area. The grant was valued at more than $40,000. This equipment is available to the faculty and graduate students for instructional purposes as well as for research.

The State Department of Education provided a $60,574 grant to the Department of Industrial Education to continue the trade and industrial teacher education program offered throughout South Carolina. This grant provided for the preparation of new teachers for vocational subjects through the cooperative efforts of the Office of Vocational Education and the Department of Industrial Education.

Elementary and Secondary Education faculty members received grants from Phi Delta Kappa; Commission on Higher Education for
Teacher Improvement for a Center for Excellence in Mathematics and to study freshmen minority students at Clemson; U. S. Department of Education for Secondary Guidance program at the graduate level and for Teacher Incentive program; and South Carolina State Department of Education for early identification of pre-school high-risk students.

**Special Activities and Services**

Last year the College of Education provided a variety of services to the South Carolina Department of Education, school districts and teachers continuing their education. For example:

- Special institute graduate courses on the educational applications of computers were taught in several school districts.
- The Clemson Writing Project, a joint venture of the College of Education, the College of Liberal Arts and seven nearby school districts, worked with classroom teachers to help them teach writing in the public schools.
- The College of Education, in cooperation with the State Department of Education, provided staff development programs for trade and industry teachers and other vocational teachers.
- The annual Clemson Reading Conference provided an opportunity for reading and elementary teachers to obtain information from national leaders on how to improve reading instruction in the schools.
- The Office of Educational Services and Placement welcomed 45 school districts to the campus. The district recruiters conducted approximately 500 interviews with Clemson teacher candidates.

Through this variety of programs, Clemson has attempted to expand the opportunities for public school teachers and students throughout the State.

In addition, the Department of Industrial Education, in cooperation with the South Carolina Vocational Association, provided special training for 12 Egyptian teachers and training directors. Special training programs were provided for 16 industrial trainees from printing and related industries.

Clemson's Air Force ROTC program was chosen best in the nation in 1984. This highest honor brought national, regional and State accolades to the Clemson unit.

During Alumni Reunion Week, Major General T. Eston Marchant, state adjutant general of the S. C. National Guard, presented a 1903 cannon to Clemson University and the Military Science Department. The cannon was dedicated to all Clemson war dead and was received by Judge Walter T. Cox, Jr. on behalf of the University. The dedication inscribed on the cannon reads: "Dedicated to the memory of all Clemson gentlemen who have made the ultimate sacrifice in the service of their country..."
‘That the TIGER’s roar may echo...’” The reconditioned cannon is on permanent display in front of the Military Science Department office.
COLLEGE OF ENGINEERING

Technological preeminence has been the backbone of this nation's economic and social achievements. The growing recognition of the critical role that engineering manpower plays in maintaining this nation's preeminence in the world has created a great demand for qualified engineers in industry, government and education. In an effort to meet this demand for larger quantities of engineers while maintaining quality in education, research and public service, Clemson University's College of Engineering continues to improve the efficiency and quality of both its faculty and curriculum.

The college presented its five-year plan to the Clemson Board of Trustees in April 1985. The report outlines the goals of the college and the actions required to achieve those goals. The result of the board's commitment to the plan will be an enhanced public image of the engineering academic program, a faster development of academic and research programs, an increased potential for interaction with industry, an improved student learning environment, and a better industrial development atmosphere.

The college received a record amount of gifts and contributions this past fiscal year, and research in the college, in terms of contract and grant awards, was greater than any past year. Other significant events in the College of Engineering during the 1984-85 fiscal year include the approval by the Commission on Higher Education of a Bioengineering Alliance between Clemson University's Department of Bioengineering, the Medical University of South Carolina and the University of South Carolina. The alliance will lead to the exchange of faculty, medical interns, residents and graduate students, more joint research efforts, and regular conferences at all three campuses for exchanging ideas and research findings pertaining to the bioengineering field.

The Commission on Higher Education authorized the University to establish a Center for Semiconductor Device Reliability. The center evolved out of a national research project in the Electrical and Computer Engineering Department aimed at improving very large scale integrated (VLSI) circuits. More information on this center and the VLSI research can be found in the research section of this report.

This year saw the chartering of an alumni chapter of Tau Beta Pi, the national engineering honor society. This newly chartered organization will be open to area residents who graduated as members of Tau Beta Pi from any engineering school. Pi Tau Sigma, a national mechanical engineering honor society, held its chartering ceremony at Clemson in September. Industrial engineering students at Clemson have started a campus chapter of the Institute of Industrial Engineers.

For the first time in the 36-year history of the Ceramic Engineering
Department at Clemson, there is a new department head. Gordon Lewis, formerly of the University of Missouri-Rolla, succeeds G. C. Robinson, who will continue to teach in the department as well as devote more time to developing a research center in ceramics processing to increase the college's service to the State's ceramics industries.

Instruction

The college has developed a truly uniform freshman curriculum. Starting in the fall of 1985, each entering engineering student will be required to complete a common freshman year after which students with satisfactory grade point averages can transfer into their desired engineering majors. This new program will be beneficial for students as well as faculty in that it will provide 1) an opportunity for more freshman students to consider engineering as a career, 2) a baseline which will be useful for predicting probable success in the engineering curricula, and 3) experiences which enable students to better select a specific discipline. The program will improve advising during the critical freshman year and is so constructed that should a freshman choose, he/she could transfer to any program at Clemson University without losing any credits.

R. D. Holstead, formerly of Louisiana Tech University, joined the College of Engineering in June 1985 to direct the freshman engineering program. A student development specialist, F. M. Riley, will assist Dr. Holstead in advising the students.

In August 1984 the college announced plans to drop the B.S. degree program in engineering technology (E.T.). The decision is in keeping with the college's mission and long-range goals to focus on strengthening the traditional engineering disciplines (electrical, civil, chemical, mechanical and industrial engineering) as well as the college's unique programs (bioengineering, environmental systems, computer, ceramic and materials engineering, automated manufacturing, and computer graphics and design). The E.T. program will be phased out over four years so the 225 students currently enrolled can complete the program.

In May 1985 the Commission on Higher Education approved a request from Clemson to establish a Ph.D. degree program in computer engineering. The program will begin in fall 1985. This is the only such program in South Carolina.

The College of Engineering is the largest academic unit on campus in terms of enrollment and degrees granted. Fall 1984 enrollment reached 3,511; 3,164 of these students were undergraduates and 347 were graduate students. For 1984-85 a record 610 baccalaureate degrees were awarded in addition to a record 127 master's and 14 doctor degrees.

Many Clemson engineering students found the Cooperative Education Program to be an increasingly important component of Clemson University's curriculum. During 1984-85 more than 85 percent of all participants
in the Cooperative Education Program were engineering students. The program provides students with challenging industrial work experience related to their college curriculum and is sponsored by approximately 200 Southeastern companies.

Starting salary offers for B.S. graduates remain high and continue to be a negative incentive for graduate school attendance. The average accepted starting salary (non-government) for a 1985 Clemson engineering graduate with a B.S. degree was $26,862 per year. With more students wishing to enter the B.S. degree programs to meet industry demand, and comparatively fewer Ph.D. graduates, the engineering education profession is experiencing major faculty shortages. Although the College of Engineering is being challenged to meet the demands of industry, a goal of excellence in education for all of its students remains the primary objective.

The demand for women and minority engineers also continued to increase in the past year. In response to this, minority enrollment increased from 201 in fall 1983 to 219 in fall 1984. This increase counters the national trend in which minority engineering enrollments are declining. Fall 1984 figures show that women comprise more than 17 percent of the total enrollment in the College of Engineering and almost 20 percent of the freshman class.

Clemson University was officially accepted into membership in the National Consortium for Graduate Degrees for Minorities (GEM) in October 1982. The first Clemson GEM student, M. C. Threatt, received an M.S. degree in computer engineering in December 1984. One new award, to a junior engineering student, was made during the 1984-85 fiscal year. The primary purpose of GEM is to increase minority enrollment in engineering graduate schools.

The Summer Engineering Minority Program for high school students marked its eighth year in 1984-85 and continues to be a success. More than 650 qualified students have participated in this program. Both this program and a minority scholarship program are sponsored by industry and foundations.

Industry provides considerable support to the College of Engineering for enhancing educational opportunities for students. One example of this support is the recent major gift by Harris/Lanier of $250,000 worth of computer equipment to the college for use by graduate students. Another example of industry support is the gift from NCR of Liberty, S. C., to the Department of Electrical and Computer Engineering of $10,000 plus more than $75,000 worth of NCR equipment, including a “tower” worth approximately $26,000. The gifts will support a computer systems integration laboratory that will allow students to work with personal computers to study the monitoring and control of processes used in the equipment manufacturing industry.
The John Fluke Company donated about $14,000 worth of Fluke instruments to the Electrical and Computer Engineering Department to be used in undergraduate laboratories to make very reliable and accurate measurements of electrical quantities. The Deutz Corporation donated a diesel engine worth $10,000 to the Mechanical Engineering Department to be used for research and as a teaching aid in senior-level laboratories in mechanical engineering. The Department of Mechanical Engineering also received a 150-ton Lombard Vertical Extrusion Press from the Atlantic Richfield Company. The press and ancillary equipment are valued at $95,000.

The Department of Industrial Engineering received a gift of three model 1200 HD microcomputers and peripherals from the Tandy Corporation. Richards Medical Company donated a surgical microscope ($12,000), and Robert Crowder and Associates donated $21,595 worth of medical staples and instruments to the Bioengineering Department.

Within the Department of Electrical and Computer Engineering, the summer Master of Engineering program, begun in 1980, is funded totally by AT&T Technologies. Thirty-nine students were enrolled for the first session of summer '85. This year's graduating class contains seven students who will receive M.Eng. degrees, bringing the total number graduated from this program to 32. Another successful program for the Electrical and Computer Engineering Department is the Industrial Graduate Fellowship Program. Presently, nine M.S. students and two Ph.D. students participate in this program. Each student receives a fellowship of $3,000-$5,000, a summer job opportunity and a graduate assistantship, providing total support ranging from $10,700 to $12,500 for the academic year.

The Department of Chemical Engineering has set as a long-term goal the strengthening of its graduate program. To achieve this goal, three programs were implemented during the 1981-82 academic year that continue to provide strong support. These programs are: 1) the Master of Science Industrial Residency Program, 2) a Program for Teaching and Research in Process Automation, and 3) a new Industrial Graduate Fellowship Program. The Industrial Residency Program started with just two companies and has grown to seven. Seventeen students have participated or are presently participating in the program. During the 1984-85 academic year, 12 graduate students were participating in one or more of these three programs involving financial commitments from industry in excess of $200,000.

Several students in the college received prestigious honors and awards. K. K. Gow, mechanical engineering (ME) senior, was awarded the H. W. Close Fellowship to pursue a master's degree in mechanical engineering at Clemson. Each year, only one such fellowship is available on a University-wide basis. ME students have won the fellowship for the past two
years. M. T. Nelson, ME senior, won first place at the 1985 ASME Regional Student Paper Competition.

In the Department of Industrial Engineering, C. Porter received a Dwight D. Gardner Scholarship. R. K. Gerwig received an MTM Association for Standards and Research Scholarship from the Institute of Industrial Engineers (IIE). L. F. Sargent was recognized as the department’s outstanding student by the Greenville-Spartanburg Chapter of IIE. G. D. Neale, a Ph.D. student in industrial engineering, was the recipient of the J. T. McCormack Scholarship from the Old South Chapter of the American Society for Metals.

H. A. Smith, civil engineering senior, was presented numerous awards including the 1985-86 Centennial Fellowship, awarded by Tau Beta Pi to its most outstanding fellow. Ms. Smith was also the recipient of an "Outstanding Woman Award" from the University, the Earle Award, and the Norris Medal, given annually to a graduating senior for general excellence in scholarship and extracurricular activities.

The College of Engineering faculty’s dedication to quality education and an enriched student environment can be seen in the number of awards presented to this faculty. (Additional awards are mentioned in the "Research" section below.) C. C. Fain, professor of ceramic engineering, received one of seven awards of merit from the Clemson local chapter of American Association of University Professors. R. F. Nowack, associate professor of civil engineering, was the winner, for the second consecutive year, of the Byars Prize for Excellence in Teaching Engineering Mechanics. (Dr. Byars, who gave this award, retired this year.) Professor Nowack was also the recipient of the prestigious Algernon Sydney Sullivan Award, given to him for his outstanding contributions to the academic, social and spiritual lives of Clemson students.

In a first-ever tie, J. W. Lathrop, professor of electrical and computer engineering, and B. L. Sill, professor of civil engineering, were recipients of McQueen Quattlebaum Engineering Faculty Achievement Awards, given annually to the faculty member in the College of Engineering with the most significant accomplishments during that year.

C. E. G. Prziembel, department head and professor of mechanical engineering, was selected to lead a mechanical engineering student group on a two-week industrial/cultural tour of Europe. The tour was the result of a recent exchange agreement between the American Society of Mechanical Engineers and the Vereins Deutscher Ingenieure. The students represented universities from the United States and Mexico. The study abroad program continues at Clemson University. J. C. Martin, professor of electrical and computer engineering, accompanied Clemson University students to the University of Bristol, in England, as part of this program.
Research

Clemson University continues to be the leader in engineering research among institutions of higher education in South Carolina. Engineering research at Clemson has three essential objectives: to seek new knowledge, to seek answers to both the short- and long-term problems of the State and nation, and to support advanced-level educational programs by providing research experience for students.

The College of Engineering at Clemson traditionally receives a greater percentage of research funds (30-40 percent) from industry than do engineering departments at most other universities. More than $6.8 million of funded grants and contracts were in force for research in 1984-85. During the past year, 78 faculty were engaged in research. Their efforts were supported by 216 graduate and 105 undergraduate students.

The Center for Semiconductor Device Reliability Research completed its first full year of operation. Research programs aimed at understanding why electronic components fail after manufacture are under way on both solar cells and VLSI integrated circuits. Laboratories in Rhodes Engineering Research Center are now in full operation for electrically characterizing these devices and for subjecting them to various levels of environmental stress. Support from industry for the center's programs has reached $1,937,097. Cooperative technical arrangements have been established between the center and number of device manufacturers, with samples from General Electric, Texas Instruments, Harris, Chronar, Sovonics and Arco Solar having been submitted for evaluation during the year. Contractual billings for operation of the center exceeded $500,000 for the fiscal year ending June 30, 1985. In addition, surface analysis equipment exceeding $750,000 was installed in the University's Central Electron Microscope Facility as a result of grants to the center, and this equipment is being utilized primarily by center personnel.

Approved by the S. C. Commission on Higher Education in 1981, the Engineering Center for Automated Manufacturing Technology (CAM) continued to grow in 1984-85 under the direction of F. W. Paul, McQueen Quattlebaum Professor of Mechanical Engineering. The research center has two industrial sponsors, Reliance Electric Company and the Torrington Company. Three new contracts were received through the CAM center this year, from NASA, Alcoa and Savannah River Laboratories. The center had its first annual invited executives conference in January. There were approximately 45 industrial participants from 28 companies in the Southeast. The CAM center has joined with Machine Intelligence Center (at the University of South Carolina) to submit a proposal to NSF for the establishment of the S. C. Productivity Research Institute.

A partial list of other projects gives an indication of the scope and breadth of engineering research at Clemson.
The faculty of the Department of Ceramic Engineering are engaged in a number of research areas. Research has been conducted at the Savannah River Plant on radioactive waste disposal methods, and a project is continuing on waste disposal sponsored by Argonne National Laboratory. Work continues on developing automated manufacturing applications to the ceramic industry. AISI is sponsoring a project on the influence of steel impurities on the life of refractory ladle linings. The influence of process variables in refractories manufacture is being investigated in a project funded by the CAM center. The development of carbon fibers for application in composites is continuing.

In Chemical Engineering, the Program for Polymer Processing continues to receive both national and international recognition. Research on the production of carbon fibers and composite materials is being pursued. The increasingly successful and influential “Fiber Producer” conference held at Clemson was organized and chaired by a Chemical Engineering professor this year. The Applied and Theoretical Thermodynamics Program continues to progress. A new faculty member was hired last year whose research interests are high pressure phase equilibrium and supercritical fluid extraction.

With support from the National Science Foundation, NASA, DOE, the South Carolina Energy Research and Development Center and Carre, Inc., several different energy systems are being investigated in the Department of Mechanical Engineering. These include packed beds, phase-change thermal energy storage, fluidized beds, dynamic hyperfiltration membranes, heat pumps and low pressure ratio/high efficiency gas turbines. Fundamental engineering research in separated flows with heat addition, natural convection in enclosures and single droplet evaporation is also being conducted.

In the area of applied mechanics and engineering materials in the Department of Mechanical Engineering, the principal research activities are focused on the behavior of composite materials and metals. Research programs are being funded by NASA, Torrington and Carre, Inc. Both analytical and experimental studies are under way. Research in the areas of thermal buckling of railroad tracks and the dynamics of railroad vehicles is being supported by the American Association of Railroads. Research activities in the area of robotics and flexible manufacturing have attracted national attention. Activities include the investigation of industrial robots, end-effectors or smart hands, computer-aided design of forging dies, and computer-aided selection of materials for gears.

Researchers in the Department of Civil Engineering, with the help of a 40-foot wind tunnel, are working to help structural engineers and contractors understand how structures react to wind. The results of this research may be particularly useful for buildings in areas prone to tornadoes or hurricanes. In the structures area, experimental and ana-
lytical research is being conducted on a project to understand the behavior of composite masonry walls subjected to earthquake loads. Other structures research is being conducted on mathematical models to simulate cracking in reinforced concrete, satellite separation dynamics and flexible pole shipboard retrieval systems.

Faculty working in the Clemson Hydraulics Laboratory, part of the Civil Engineering Department, completed two studies, one on unsteady turbulent jets and the other on the feasibility of using physical models to study pollutant transport in groundwater. Four multi-year studies were continued: one to evaluate storm water inlet designs, another to study heat loss from cooling ponds at the Savannah River Laboratory, one to measure evaporative losses from irrigation systems, and the fourth to develop a methodology to establish comprehensive in-stream flows and predict flow deficiencies. New laboratory research projects were initiated during the past year to study the efficiency of a new storm water inlet design and to develop a model capable of predicting the transport and fate of contaminants in surface waters. In the construction area, research is continuing in the field of asphalt pavement, including studies on asphalt stripping, asphalt chemistry and use of nuclear asphalt content gages. Additional research is being conducted in construction management on the application of microcomputers.

Solar cell reliability research is continuing in the Department of Electrical Engineering. Total expenditures since December 1977 for this project have been approximately $860,000. The project is sponsored by the Jet Propulsion Laboratories for the Department of Energy. Electrical engineers continue the study of fabrication and properties of very small transistors. The project has received more than $300,000 in research support from the Office of Naval Research, the Rome Air Development Command, the Naval Research Labs and the National Bureau of Standards. The program is continuing and will be expanded in the coming year.

Environmental systems engineers continue research on the rate of breakdown of manmade organic compounds by bacteria in the natural environment and in wastewater treatment systems. This project is supported by a major grant from the National Science Foundation.

Engineering graphics faculty are studying sediment transport on steep slopes, research for the S. C. Water Resources Research Institute.

In the Department of Industrial Engineering, a Reliance Electric Company/"CAM" center project focusing on simulation as a tool in evaluating manufacturing system design and operation continues. Another Reliance Company project on the development of aggregate inventory control and evaluation procedures is being pursued, as well as a project investigating cumulative trauma disorders of the wrist in manual work tasks, which is jointly sponsored by "CAM" and the Association of
Textile Industrial Engineers. R. P. Davis, department head, received a grant from the General Electric Foundation for program development in Manufacturing Control Systems Planning and Design.

Researchers in the Department of Bioengineering are studying the influence of bone fixation on the incidence of fracture healing. They are investigating collagen formation in the pores of arterial grafts. An evaluation has been made of a novel surface in skin implants. Additional research was performed on other prosthetic implantable devices.

Several members of the college faculty received special recognition in 1984-85 for their accomplishments in research and public service. T. M. Keinath, department head and professor of environmental engineering, was honored by the American Society of Civil Engineers with the Walter L. Huber Civil Engineering Research Prize in recognition of his research on the dynamics of secondary clarifiers. L. G. Rich, Alumni Professor of Environmental Systems Engineering, was given the W. T. Linton Service Award by the Water and Pollution Control Association of South Carolina. B. C. Dysart III, professor of environmental systems engineering, was conferred the Bald Eagle Statue for his two years of service as president and chairman of the Board of the National Wildlife Federation. J. C. Jennett, professor of environmental engineering and dean of engineering, was named to the Board of Directors of the American Society of Environmental Engineering Professors.

C. E. G. Przirembel, department head and professor of mechanical engineering, was elected vice president for Professional Interest Councils for the American Society of Engineering Education and will serve on the Executive Committee of the Board of Directors. Dr. Przirembel was named a Fellow of the American Society of Mechanical Engineers. Dr. Przirembel also was elected chairman of the National Committee of Mechanical Engineering Department Heads, which operates under the auspices of the American Society of Mechanical Engineers. D. E. Beasley, assistant professor of mechanical engineering, co-authored a paper that was selected the most outstanding paper in the Southeastern section by the American Society for Engineering Education. D. W. Bradbury, Alumni Professor of Mechanical Engineering, and W. G. Hudson, associate professor of ME, were initiated charter honorary members of the newly established Phi Kappa Chapter of Pi Tau Sigma, the national honorary mechanical engineering fraternity. R. S. Figliola, assistant professor of ME, was selected for a special NSF travel grant to participate in the NATO Advanced Study Institute on Natural Convection held in Cesme, Turkey.

For his innovative research on paving and construction materials, J. L. Burati Jr., assistant professor of civil engineering, received a Presidential Young Investigator Award from the National Science Foundation. The Presidential Young Investigator Awards program was established in 1983.
as a way to keep the nation’s most promising and outstanding young scientists and engineers on American campuses. This is the second consecutive year that a Clemson engineering faculty member has been awarded this prestigious award. B. L. Atchley, professor of civil engineering and president of Clemson University, was elected Engineer of the Year by the S. C. Society of Professional Engineers.

J. Y. S. Luh, Quattlebaum Professor of Electrical and Computer Engineering, was named a Fellow in the National Institute of Electrical and Electronics Engineers (IEEE), an honor going to only the most extraordinarily qualified in the electrical and electronics field of engineering. Professors of electrical and computer engineering D. J. Dumin (Senior Rhodes Professor) and J. D. Spragins were elected senior members of the IEEE. M. A. Bridgwood, assistant professor of electrical and computer engineering, was appointed to the Educational Liaison Committee of the international Electric-Oversees Electro-Static Discharge Association. J. T. Long, professor of electrical and computer engineering, received an IEEE Centennial Medal. A. W. Bennett, department head and professor of electrical and computer engineering, was elected vice chairman of the Southern Association of Electrical Engineering Department Heads.

T. H. Oswald, director of Continuing Engineering Education and professor of engineering technology, was elected president of the South Carolina Society of Professional Engineers (SCSPE) — Piedmont Chapter.

R. P. Davis, department head and professor of industrial engineering, was honored by the Greenville-Spartanburg chapter of the Institute of Industrial Engineers as its “Outstanding Industrial Engineer” for 1985. W. J. Kennedy Jr., professor of industrial engineering, received a special citation from the Energy Management Division of the Institute of Industrial engineers. Dr. Kennedy was also appointed to the editorial boards of two international journals, *Engineering Costs and Production Economics* and *Maintenance Management International*. J. Haddock, assistant professor of industrial engineering, was named the Research Director of the Operations Research Division of the Institute of Industrial Engineers.

Bioengineering Professor and Department Head A. F. von Recum was invited to give the keynote address at the 1985 International Congress on Tissue Integration in Oral and Maxillo-Facial Reconstruction in Brussels, Belgium. Dr. von Recum was hailed by the conference coordinator as “one of the most well-known experts [in the world] on the subject.”

In the Department of Ceramic Engineering, T. D. Taylor was appointed to the Advisory Committee of the Southeastern Section of the American Ceramic Society.

Two faculty members had books or manuals published in the past year. J. C. McCormac, Alumni Professor of Civil Engineering, had *Design of Reinforced Concrete*, Spanish edition, published by Harper & Row. The

**Public Service**

The Continuing Engineering Education (CEE) program is the primary public service arm of the College of Engineering. As such it is the vehicle by which the lifelong learning needs of the region’s practicing engineers are served. The advancement of technology and the increasingly competitive environment in which engineers and companies must operate mandate a constant renewal of technical competence. The CEE program strives to remain in touch with the engineering community and to offer the most responsive seminars, short courses and conferences possible. Where a need exists and Clemson faculty are not available, outside resources are employed. The key criterion is responsiveness, and constant self-evaluation and innovation are employed to ensure that this criterion is met.

Total program activity for this fiscal year was up dramatically from 1983-84 for two major reasons. There has been a rebound of company participation in continuing education as the economy has recovered from the 1982-83 recession. Second, and most responsible for the increased activity, is the offering of an extensive series of week-long microcomputer training courses in locations throughout South Carolina and as far away as Washington, D. C. A computer training firm from Greenville, S. C., is employed to teach these courses since faculty and (mobile) computers are not available. These seminars are enormously popular and promise to become more so.

Total attendance for CEE seminars, short courses and conferences during 1984-85 was 6,269. This is up 70 percent from 1983-84. There were 332 program days and 127 seminars delivered. Five short courses and four major conferences were held. The number of professional engineering reviews held was 134 and in-plant seminars numbered 15.

In addition to the delivery of a large number of computer seminars, the Professional Engineering Review Series offered in the spring in Greenville and in the summer in Aiken, Columbia, Charleston and Charlotte was continued. Faculty continued to teach the Fundamentals of Engineering (“Engineering-in-Training”) reviews to engineering seniors on campus in cooperation with the Tau Beta Pi engineering honorary fraternity. CEE hosted a major workshop on “Membrane Technology” for the U. S. Department of Energy. They delivered a series of programs on energy management under informal contract with the S. C. Energy
Office. There was a record attendance at the fifth annual Fiber Producer Conference at Textile Hall in Greenville, S. C. A Plant Engineering Executives' Forum for corporate plant and facilities engineers from leading U. S. companies was held in conjunction with Plant Engineering magazine. CEE hosted a semester-long course in Greenville on heating, ventilating and air conditioning in response to the critical shortage of qualified HVAC engineers. CEE offered a series of Construction Quality Management seminars in cooperation with Daniel International Corporation.

In June 1985 CEE was successful in a proposal to Daniel International for the planning phase of a system of continuing professional development courses, both non-credit and graduate-level. These courses would be taught in the Daniel facilities and would, in part, incorporate video-based instruction techniques.
COLLEGE OF FOREST AND RECREATION RESOURCES

The College of Forest and Recreation Resources is truly the forest and recreation resources center for South Carolina. All research and Extension activities in forest management, wood utilization, and recreation resources and services are the responsibility of two departments — the Department of Forestry and the Department of Parks, Recreation and Tourism Management. In addition, the Regional Resources Development Institute (RRDI) operates under the auspices of the college to stimulate and coordinate research in the areas of natural resources allocation, management and policy assessment.

The importance of this college's functions comes into sharp focus when we realize that the forest products industry annually adds $2.5 billion (28,500 employees), while recreation and tourism contribute an additional $3 billion (70,000 employees) to the economy of South Carolina.

Founded in 1970, the college is dedicated to promoting the wise management, use and stewardship of the State's forest resources and to enhancing the quality of life of its people through a rewarding use of leisure.

Department of Forestry

The Department of Forestry's programs in education, research and Extension are unique within the State of South Carolina. As such, the department plays an important role in educating many of the foresters who manage the 12.5 million acres of forest land in the State. Clemson's curricula in forest management and wood utilization emphasize the role of the forester as a steward of our forest resources. Research programs emphasize problem solving and gaining fuller understanding of the forest and its use. Extension programs are designed to be sensitive to the needs of forest landowners with special emphasis on small private landowners.

During the year, the department awarded its second Cleaveland scholarship to an incoming freshman. This four-year continuing scholarship is given to an outstanding freshman every year and is the result of a $30,000 bequest in the will of the mother of an alumnus. The South Carolina Forestry Association funded a $500 scholarship for entering freshmen to support the department's recruitment of highly qualified students. The graduate program received continued support from the South Carolina Forestry Commission with its long-term commitment to fund one graduate student each year on a mutually defined problem area. Also, Boise Cascade Corporation initiated a fellowship, and Westvaco continued its fellowship support of the department's Ph.D. program.

Dr. Vernon Robinson and Mr. Larry Nelson joined the faculty as forest economist and forest Extension herbicide specialist, respectively. Dr.
Robinson brings over 20 years' experience as a researcher with the U. S. Forest Service and will teach forest valuation. Mr. Nelson most recently worked with the Auburn University Silvicultural Herbicide Cooperative and is completing his Ph.D. at Auburn.

As a group, the forestry faculty produced approximately 50 scientific and professional publications, including five departmental bulletins and research papers.

Teaching

During the academic year, 24 candidates received the Bachelor of Science degree; 20 graduated from the forest management program and four from the wood utilization program. Twelve graduate degrees were awarded: five Master of Science degrees, six Master of Forestry and the first Ph.D. after the program was initiated more than three years ago.

For the fifth consecutive year, the forestry faculty taught two three-week continuing education sessions in silviculture to U. S. Forest Service personnel. Also, for the second year, the department was the sponsor of the U. S. Forest Service short course on Sale Layout and Timber Harvesting. This six-week course brought in foresters from all over the eastern United States. The choice of this department as the sponsor for both of these courses is a credit to its reputation in silviculture.

Research

Research in the Department of Forestry is undertaken in timber production, forest management, wood utilization and biological productivity, and is supported by State appropriations, federal McIntire-Stennis funds and outside grants.

The timber-production area is made up of a group of scientists in forest soils, silviculture, entomology, genetics, pathology and tree physiology. They are concerned with problems that prevent full timber productivity. Twenty-nine projects are presently funded by State and McIntire-Stennis funds. New projects were started to evaluate native and exotic non-leguminous, nitrogen-fixing species for use as soil improvers, to develop a physiographic classification of forestlands for South Carolina, and to evaluate the productivity of mixed-pine hardwood stands of the Southeast.

Another 13 projects are supported by grants from the U. S. Forest Service, other federal agencies, private industry, and State agencies. Grants received this past year were as follows:

- Amount and control of sprouting from sheared and chainsaw cut hardwood stumps. $13,300. U. S. Forest Service, Southeastern Forest Experiment Station.
• Drought assessment procedures for the forest survey in the Southeastern United States. $32,164. U. S. Forest Service, Southeastern Forest Experiment Station.

• Determination of biomass and nutrient content of the root system of a mature loblolly pine plantation. $13,015. U. S. Forest Service, Southeastern Forest Experiment Station.

Publications from projects terminating in this area were quite diverse. Among them was a handbook with guidelines for managing pine bark beetles produced for distribution to professionals and managers of forestland. Studies on the productivity of Piedmont hardwood stands resulted in publications that quantified this productivity in terms of wood volume and fuel. Also, the biomass and nutrient content of a 41-year-old loblolly pine plantation on a poor site in South Carolina was quantified. Weight loss and nutrient dynamics in decomposing woody loblolly pine logging slash were also investigated and the results published. Finally, a cooperative project with the South Carolina Forestry Commission and the U. S. Forest Service to develop a market for portable sawmills in South Carolina resulted in the transfer of the sawmill to the commission for use as a demonstration for private landowners. It is anticipated that this will result in more complete use of hard-to-reach, small stands of beetle-infested timber.

Research in the forest management area seeks solutions to forest-based, multiple-use problems. Seventeen projects are under way in this area, with three new projects beginning this year. The first two will examine some of the problems associated with hunting on forest lands. Specifically, habitat utilization of wild turkey poult's in the Southern Appalachians will be studied, and the values and impacts of hunting leases on forest management investments in the Southeast will be investigated. International Paper Company is helping finance this latter project. The third new project involves the use of remote sensing to quantify biomass availability in the Southeastern United States. Earlier projects using remote sensing techniques have resulted in accurate and less expensive methods to quantify extensive areas of forested terrain. Three grants were funded this year by the U. S. Forest Service, Southeastern Forest Experiment Station, as follows:

• Economic evaluation of loblolly pine harvest schedules for reducing losses from southern pine beetle outbreaks, $20,000.

• Remote sensing in support of the spruce-fir acid deposition program. $7,500.

• Economic analysis of increased regeneration through intensive harvesting in an 8-county area of Georgia. $12,000.

Research in this area resulted in various publications. Among them are the following: a vegetation-landform classification of forest sites within
the upper Coastal Plain of South Carolina, a technique for implanting telemetry in beaver, the effects of camping on selected soil and vegetative properties, a determination of residential firewood consumption, and a method of modeling forest biomass accessibility with digital terrain data.

Wood utilization research continued to grow with the addition of two research associates and a research technician in the area of wood chemistry. This program, which was inaugurated last year, has received grants from industry and government to do research on wood plasticization, surface characterization of weathered wood, and water-soluble cellulose derivatives. Major equipment purchases were completed, and research using these new instruments is proceeding well. In August 1984, the program organized an International Applied Wood Chemistry Symposium that attracted scientists from Brazil, Japan, the People’s Republic of China, Chile and the United States.

In other areas of wood utilization, a project was started to develop and test market a wainscoting kit. Also, two grants were funded as follows:

- Effect of steaming on the drying rate of southern red oak and microscopic changes caused by steaming. $14,010. U. S. Forest Service, Southeastern Forest Experiment Station.
- Alternatives to conventional biomass fuel drying. $20,000. Energy Research and Development Center, Clemson University.

Among the publications in this area were the following: tables of whole-tree weight for selected U. S. tree species published by the U. S. Forest Service, properties of red oak lumber dried by radio frequency/vacuum process and dehumidification process, physical and mechanical properties of cement bonded southern pine excelsior board, and fuel values of stems and branches in white oak, yellow-poplar and sweetgum.

Five of the department’s faculty are located in the South Carolina Coastal Plain either at the Belle W. Baruch Forest Science Institute near Georgetown or the Forest Sciences Laboratory in Charleston. All of them work in the general area of biological productivity in which 15 State or McIntire-Stennis projects are under way.

Over the past year, one of these faculty members was on sabbatical leave and was stationed with the Pacific Northwest Forest and Range Experiment Station in Olympia, Wash. Studies were jointly conducted with Forest Service personnel to evaluate and compare some physiological traits of hardwood species as related to use in short rotation and conventional forest management systems in the Pacific Northwest. Much of the knowledge gained in this cooperative study will have applicability to southern short rotation forests.

Over the year, the National Science Foundation continued support for a study that monitors the Hobcaw Barony groundwater and its relationship with the intertidal region. Further funding ($71,144) from the
National Science Foundation through the University of South Carolina will support work to determine the input of nutrients back and forth from forest to salt marsh.

Publications from this group resulted in information on the sediment concentration from intensively site-prepared wetland forest sites, the waterlogging tolerance of lowland tree species of the South, and the adaptations of trees to flooding with fresh water.

**Extension**

The landowner contractor program being conducted with assistance from South Carolina State College continues to grow. Efforts are being started in Marlboro and Williamsburg counties. Landowners participating in this program are provided with low-cost forestry management options for reforesting and managing their land.

The college continues as an active supporter of the Forest Productivity Task Force. Last year more than 6,500 acres of land were reforested as a result of this program. The college developed a task force handbook and was instrumental in designing and conducting nine training programs for more than 500 task force workers. Other activities include technical support and assistance to county Extension agents working with the program and participation in 20 county-level educational programs for landowners.

The department conducted three workshops for county Extension agents. Topics included were: using computer models to evaluate economic opportunities in forestry, natural regeneration of forest stands, and an introduction to forestry course for agents beginning to work in this area. Forty-six agents attended these workshops, the largest number to receive forestry instruction in any one year. Plans are to follow up with these agents and help them use their newly developed knowledge.

**Department of Parks, Recreation and Tourism Management**

**Teaching**

The program of instruction prepares students for a variety of professional careers in public and private leisure-service agencies, including county and municipal leisure services, state and county recreation resource management systems, therapeutic recreation settings, and travel and tourism management.

Highlights within the department’s instructional program for 1984-85 program included:

- A continued increase in student credit-hour production; a reflection of an increase in departmental undergraduate enrollment and an increase of non-majors in PRTM courses.
• A reaccreditation review by the National Council on Accreditation of the National Recreation and Park Association.
• Adjustments in courses to incorporate microcomputer applications within the field.
• Faculty recruitment to keep pace with the growing student demand for the travel and tourism emphasis area.

Public Service/Research
Research dollars have been used to study local problems in South Carolina. Economic benefit models from local festivals have been developed and tested in several South Carolina localities. An instrument and sampling scheme for developing traveler profiles in South Carolina tourist regions has been applied. Faculty members continue to actively pursue research that will bring national visibility to Clemson and South Carolina. A national research meeting was hosted, drawing together 200 scientists to present recent trends in outdoor recreation. Faculty made presentations at nine national and 13 regional meetings. Forty-two publications were generated, with one-third appearing in national research journals. Faculty are continuously requested to serve as referees or special editors of research publications. The National Parks Service Cooperative Research Unit administratively housed in this department has expanded its efforts requiring increased involvement of this faculty. New thrusts and visibility in tourism research are projected through the proposed formation of an Institute for Recreation and Tourism.

Public Service/Extension
South Carolina’s accommodations tax revenues spurred local governments to a growing awareness of the importance of tourism as an economic force. This was evidenced by the number and nature of Extension-related requests for information and technical assistance during the year.
Successful assistance was given to four South Carolina citizens starting new businesses, to 13 State and local government offices, and to 32 private companies and chambers of commerce. Out-of-state requests were mostly met by referral to appropriate agencies or companies in the requestors’ own state or province.
Sixty-two Extension-related requests were processed during the year, with festival development and impact analysis, planning and development of improved tourist services, and general tourism statistics and marketing information being the most sought service by South Carolinians. In addition, tourism development feasibility studies were accomplished for five counties through student projects in the community tourism development course.

Clemson University Outdoor Laboratory
The programs and services available at the Outdoor Laboratory serve
individuals and groups from every county in South Carolina. This is particularly true during the 10-week summer residential camping season when more than 600 children, teen-agers and adults with special needs are served through various programs. During the year, six summer camps, more than 150 user groups and 10,000-plus persons were served by the Laboratory staff.

The Outdoor Laboratory also is utilized by many Clemson University students and faculty members for education, research and public service. Support during the year has been received from the South Carolina Jaycees, South Carolina Sertomans, Mid-Day Lions Club of Anderson, Knights of Columbus, South Carolina Council, Department of Youth Services, Hemophilia Foundation of South Carolina and the U. S. Forest Service.

The Outdoor Laboratory, though not completely independent of State support, continues to rely less on State dollars each year while generated income and public service activities continue to increase. Five professional and support staff salaries are included in the annual PRTM budget. All other personnel, food service, maintenance and program expenses are recovered through user groups and camps.

A project to create an endowment for the Clemson University Outdoor Laboratory is under way. In 1985, the South Carolina Jaycees and Jaycee Women (Project Rainbow for Hope) pledged $125,000 over a five-year period. Camp Sertoma of South Carolina Inc. will raise the funding needed for a swimming pool at the Outdoor Laboratory during the next two years (Project SPLASH). This project is expected to cost $130,000.

**Professional Development Programs**

Growth in the number and diversity of programs and in the number of participants continued. During the past year, 15 professional development programs have been provided for State and local government, the U. S. Forest Service, Army Corps of Engineers, National Park Service, South Carolina swimming pool operators, tourism personnel, outdoor recreation planners and educators. These programs served approximately 850 clients and grossed $211,800. Services rendered are at the maximum level until staff can be added specifically for the Professional Development Program.

**Regional Resources Development Institute**

Created in 1981 as the Energy and Resource Development Institute, the Regional Resources Development Institute (RRDI) is a cooperative venture between the Southern Appalachian Research/Resource Management Cooperative (SARRMC) and Clemson University. The Institute's purpose is to stimulate and coordinate research in the areas of natural resource allocation and management, energy conservation, conflict man-
agement over natural resource uses, regional tourism assessment and development, and natural resource policy assessment. The RRDI’s projects involve scientists and graduate students of SARRMC member organizations and involve site studies throughout the entire Southeastern United States. This unique arrangement allows an exchange of ideas and skills between the National Park Service, U. S. Forest Service, TVA, U. S. Fish and Wildlife Service, the University of Georgia, Western Carolina University, North Carolina State University, the University of Tennessee, Virginia Tech and Clemson University.

The RRDI has established a reputation for applied research related to agency environmental conflict management situations. Current research programs include:

- Assessing threats to National Parks. This program has study sites in South Carolina, Virginia, Pennsylvania and Georgia.
- Developing a Regional Resource Management Program. Results were developed for the Southeast region of the National Park Service and are being implemented nationwide.
- Tourism and the National Parks. This study examines the role of the National Parks for stimulating local and regional tourism development.
- Evaluation of fee systems for non-commodity use of forest and park lands, with study sites in North Carolina and Tennessee.
- Regional assessment of public perceptions and knowledge of acid deposition problems, a content and trend analysis.

The RRDI is a vehicle for cooperative research. It enhances the College of Forest and Recreation Resources’ ability to attract funds from federal land management agencies and to attract graduate students by providing research opportunities that are both timely and tangible.

Computer Laboratory

The first full year of operation for the college’s new microcomputer laboratory was extremely successful. Joining undergraduate and graduate students in the college for instruction on use of the personal computer were personnel from the National Park Service, U. S. Forest Service, the U. S. Army Corps of Engineers, Clemson University’s Office of Professional Development and Continuing Engineering Education, and representatives from private industry. Actual attendance at the computer laboratory exceeded 29,000 participant hours and generated more than $28,000 in laboratory income. This income allowed for the purchase of additional computer hardware and software to prepare students to compete in the job market.

Plans are under way to develop undergraduate and graduate courses completely devoted to the use of the personal computer as a management
tool, to identify those college courses that may wish to utilize components of personal computer technology, and to develop State and national workshops with our clientele. Utilization of a new PRTM Department online, computer bulletin board and the development of the proposed Leisure Research Exchange: An Electronic Journal began this year.

The College of Forest and Recreation Resources is committed to becoming the technological leader in both the forestry and leisure service fields. The utilization of the computer laboratory is a major step in reaching this goal of technological growth.
It has been said that no university can ever become a great institution of higher learning without a strong program in the humanities and 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 that will enable them, regardless of their occupation or profession, to lead fuller, more useful lives and to contribute to the general welfare of society.

With these lofty ideals, the College of Liberal Arts, like all undergraduate colleges at Clemson, is steeped in a tradition of practical endeavor. Though only about 9 percent of the student body majors in liberal arts fields (800-plus majors) the faculty of the college teach almost a third of the credit hours taken by the campus student body. This underscores the importance of the college's courses to all curricula in the University.

The college is composed of the departments of English, History, Languages, Music, Political Science, Psychology and Sociology. All departments except Music offer the Bachelor of Arts degree. English and History offer the master's degree as well.

Eighty percent of the Liberal Arts faculty hold the doctoral or other terminal degree in their fields. Graduates of the college enter some of the outstanding graduate and professional schools in the country as well as work in business and government.

Public Service

The college's public service role throughout the State and region continues to grow. Frequently faculty members in Political Science are called upon by units of local and State government or business and industry for advice on such problems as poll-taking, tax matters and governmental organization. Sociologists contribute their expertise on such topics as the impact of industrial development on society, leadership training, prison reform, spouse abuse, mental health, and alcohol and drug problems. Psychologists provide clinical service to Clemson's Redfern Health Center; management training for area industries and hospitals; consultation on jury selection, eyewitness validation and expert witness on criminal sanity; survey studies for local or State agencies; and a weekly newspaper column on labor-management relations. In cooperation with the College of Nursing, Redfern Health Center and the Counseling and Career Planning Center, the psychology faculty also sponsors a local stress management clinic. Members of the English faculty work with industry by conducting seminars and workshops in technical report writing.

The Department of Languages continues to stress a practical, business orientation by encouraging Clemson students to major or minor in a
modern language while preparing themselves in business administration, engineering, computer science or textile science. Given the large foreign investment in South Carolina industry and the need for development of overseas trade markets, this is an important career option for Clemson University’s students. A $35,000 grant from the Office of Education enabled the department to expand cooperative education opportunities in multinational corporations primarily in South Carolina. The Department of Languages sponsors an annual Language Declamation Contest, which draws hundreds of participants from South Carolina and nearby states. The department also conducted 1985 summer foreign-study programs in France and Spain. An outstanding recognition of Clemson’s language students came this spring when the national Fulbright Award Committee selected three students for a year’s scholarship to study abroad, one to Germany and two to France.

Among the recipients of the college’s public service activities are the State’s schoolteachere. Improved civic education in South Carolina’s public schools is the goal of the Thurmond Seminar conducted by the Department of Political Science with funds from The Strom Thurmond Institute for Government and Public Affairs. Twenty social science teachers from South Carolina’s secondary schools participated in this summer’s institute with classes held in Clemson and Washington. As part of the Educational Improvement Act, summer institutes were conducted for Advanced Placement teachers in American history, English, European history, French and Spanish. The History Department helped 14 Piedmont social studies teachers prepare for the observance of the Bicentennial of the U.S. Constitution.

Twenty-four Piedmont-area teachers interested in teaching writing attended the third six-week summer institute of the Clemson Writing Project sponsored by the English Department and the College of Education. An advanced summer seminar on the Humanities and Writing was conducted by the English Department for 16 Piedmont teachers. Each fall the English Department presents a well-known and widely attended Children’s Literature Symposium for the State’s librarians and teachers. A faculty member is president of the national association.

Members of the college serve regularly as program leaders for the South Carolina Committee for the Humanities. Again this spring they helped organize, conduct and contribute to the Piedmont Humanities Scholars Forum. Faculty of the Music Department regularly act as resource people, performers and judges in the State and region.

The College of Liberal Arts serves the student body in a variety of ways. The Model United Nations Program, sponsored by the Department of Political Science with student participation from throughout the University, competes annually at such sites as Boston, New York and Washington. The Department of English conducts a developmental course
designed for freshmen with poor verbal skills. In addition, a writing laboratory is open to all students with writing deficiencies. As an aid to foreign students, the Department of English offers a course in English as a second language. Language students each year present full-length plays in French, German and Spanish.

The college also contributes to University life by sponsoring a large number of student organizations and extracurricular activities. The English Department sponsors the Clemson Players, the student drama group, which presents four plays during the academic year and two during summer school. This spring the Players' production of the original play "Notes of a Family," by a Clemson graduate student, advanced to the regional levels of competition. The department also sponsors the debating team and helps manage student publications, including The Tiger, The Chronicle and The Calhoun Literary Review. The Department of Music sponsors and manages the University Concert Series, the Liberal Arts Chamber Music Series, the Clemson Chorale, summer school concerts and student musical organizations, including the "Tiger" band, the symphonic band, the University chorus, the Four-Thirty Thursday Singers and the jazz ensemble.

The Department of Psychology, in cooperation with the colleges of Engineering and Sciences, supports a series of summer science camps to acquaint honor students with the sciences, including computer science and psychology. The Department of Languages offers instruction in French, Spanish and German to area elementary school students. The Department of History annually presents History Day for pre-college students in the Third Congressional District; Congressman Butler Derrick, D-S. C., presented the awards.

Three publications of national interest emanate from the College of Liberal Arts. The South Carolina Review is edited and published by faculty members in the Department of English. This distinguished journal provides a forum for literary scholarship, original poetry and outstanding fiction. The Journal of Political Science, with an international editorial board under the editorship of a faculty member in the Department of Political Science, boasts a list of authors from leading universities and colleges throughout the United States and overseas. This journal pays special attention to the scholarly contributions of younger researchers. Within the past three years, the Department of Languages has assumed the editorship of The Comparatist, a journal devoted to the literary and language interests of scholars in the Southeast.

In addition to editing these scholarly journals, Liberal Arts faculty members contribute articles to a variety of professional journals and books published through numerous university and commercial presses. Several
successful textbooks, especially in political science, sociology and English, have been published in recent years, and more are in the final stages of development.

The Department of History continues to spread the name of the University through a free, syndicated book review column published in newspapers across the country. This history book review service is the only such regular newspaper feature by an institution of higher education. The Department of English provides a similar service for children's books.

The social sciences are also very active. Members of the Psychology Department faculty are conducting research on a variety of topics such as aging, laterality of brain function, stress management and computer-assisted instruction. The Department of Sociology has revamped its curricular options to acquaint students not only with principles and theories but also their practical application in society. Faculty members conduct workshops and research in several areas, including crime, parental grief, children's responses to crisis, parental abuse and alcohol consumption, drinking and driving, and abortion.

Scholarly gatherings are regular features of the activities of the College of Liberal Arts. The college conducts programs in cooperation with The Strom Thurmond Institute of Government and Public Affairs. Other regular features each year include events in observance of Black History Month and Women's History Week. Two especially successful lecture series this past year included attention to Southern Society and Southeastern Indians. On campus this past year the college hosted the annual meeting of the Carolina's Speech Association.
COLLEGE OF NURSING

Overview

This year marks the 18th anniversary of the formation of the College of Nursing. During the life of the college, high-quality, fully accredited baccalaureate, master's and continuing education programs have been developed and offered. Because of the rigor of these programs, quality of students enrolled and the prominence of graduates, the college has attained a place of distinction among institutions preparing professional nurses.

Once again in 1985 the preeminence of our faculty has been highlighted by recognition from various sources. One assistant professor was awarded the first Excellence in Nursing Award by Gamma Mu Chapter Sigma Theta Tau. Another faculty member was cited for making an outstanding contribution to the community by interpreting medicare legislation to lay audiences. In significant numbers, faculty members have been active in giving research papers at multiple regional, national and international conferences.

An important highlight of the year was the selection of Margie N. Johnson, R.N., Ph.D., for the Clemson University Distinguished Black Scholar in Residence Award for 1985-86. This choice was made from nominees submitted by each academic unit within the University. In August 1985, Dr. Johnson will begin residence as a member of the College of Nursing faculty and continue her scholarly efforts on this campus.

A College of Nursing faculty committee is giving lead to a long-range planning effort for the college. The Shirley Toney Model is the framework being used to guide this important endeavor. It is anticipated that this work will lead to a comprehensive plan that will guide the college through the next five years.

As we move into the 19th year of the founding of the College of Nursing, we aim to make nursing education at this University the best in the South, the region and the nation. An overall objective is to offer high-quality programs which will have a favorable impact upon health care in the State and nation.

Bachelor of Science Degree Program

Multiple community resources enable undergraduate students of nursing to learn and practice within a wide range of patient-care settings. Clinical nursing experiences under the guidance of the College of Nursing faculty take place with patients in local hospitals, clinics and other health agencies.

A significant increase in enrollment in the baccalaureate program has been achieved. This was a direct response to community demand for additional nurses to staff expanding facilities. Enrollment in the bac-
The Master of Science degree program with a major in Family Health Nursing emphasizes health care of the family and its individual members in the home, community and outpatient and inpatient acute and chronic care settings. The program attracts highly qualified practicing nurses with Bachelor of Science degrees in nursing.

Under the supervision of doctorally prepared faculty, students in the program provide a wide range of health care to families who have multiple health problems. Families selected for student experiences are distributed over a wide geographic area of the upstate. Graduates of the program assume leadership roles in nursing, continue into doctoral study in nursing, and contribute to their professional and home communities.

Continuing Education

The continuing education program provided 55 workshops, seminars and conferences for registered nurses. Attendees came from 20 states to participate in a broad variety of educational programs held in a five-state area. These short-term, intensive learning experiences are aimed at helping nurses in active practice keep on the "cutting edge" of new knowledge. Additionally, inactive nurses are helped to prepare for reentry into the profession.

During the past year, the continuing education workshops and conferences were held throughout the South with some selected offerings sponsored jointly by Clemson University and other institutions of higher education and/or professional organizations. In the coming year, Clemson's offerings in continuing education in nursing will go national with at least one conference, co-sponsored by Clemson and the Holistic Nurses' Association, held at two sites: California and Arkansas. These activities are enabling Clemson University to develop a reputation as a major provider of continuing education for nurses in this region.

The Nursing Center

The Nursing Center, located on the first floor of the College of Nursing Building, serves as a model teaching center for students where the best of nursing practice can be observed, learned and tested. Here faculty and students provide nursing services, including health screening, health education, counseling, health assessment, immunization and skilled nursing services to the community. The center also provides a setting for faculty and students to engage in clinical research.

The Nursing Center began offering services to the public on a regular
basis in January 1984. During the past year, 1,077 people were served by the Nursing Center.

Two of the purposes of the Nursing Center are to provide clinical learning experiences for nursing students and clinical practice opportunities for nurse faculty. During the past year, 59 percent of undergraduate students and 29 percent of graduate students received clinical instruction in the Nursing Center and 76 percent of the faculty practiced there.

The Nursing Center continues to grow rapidly in the services offered to the community. In part, growth is due to the fact that Clemson does not have a health department located in the community. In the past, area residents desiring health department services traveled out of the area to obtain such services. Since the center offers many similar services to those available in health departments (immunizations, TB skin tests, screening for chronic diseases, physical assessments), more area residents are finding the Nursing Center to be a convenient alternative. Also, an increasing number of University faculty and staff are using the center to receive health services without leaving campus. Lastly, the center offers evening appointments, which are particularly helpful to those who work and to families with only one automobile. During the 1984-85 academic year, the Nursing Center provided more citizens with nursing services than in any previous year, a trend that is expected to continue.

Distinguished Scholar in Residence

Margie N. Johnson, R.N., Ph.D., Professor of Nursing, Texas Woman's University, has been selected as Clemson University Distinguished Black Scholar in Residence Award for academic year 1985-86.

Dr. Johnson has served as special assistant to deputy executive director of program activities for the American Nurses' Association. In this position she had special responsibility for coordinating activities for Ethnic/Racial Fellows. Additionally, she has held an appointment as deputy head and lecturer, psychiatric-mental nursing at the University of Ibadan, Nigeria, and held positions at Wayne State University and in several nursing service settings in the United States and abroad. Special honors and recognitions include selection as one of a six-member team of United States Nurse Consultants to Nigeria sponsored by United States Department of Health and Human Services and Nigerian Ministry of Health. Also, she was triumvirate-editor of the ANA Fellowship Newsletter for the Ethnic/Racial Minority Nurse Fellows.

Dr. Johnson joined the College of Nursing faculty in August 1985 and works with faculty, students and staff toward development of a strong research program with emphasis upon clinical studies that have relevance for nursing practice.
Special Recognition

This year for the first time, College of Nursing students selected nurses from clinical settings in which they have clinical practice for special recognition during the College of Nursing Honors and Awards Day program. These nurses were clinicians students found to be especially helpful to them — persons who went out of their way to assist and be supportive.

Junior students honored Jean Jackson, enterostomal therapist, Anderson Memorial Hospital; senior students honored Ann Vaughn, oncology nurse, Greenville Memorial Hospital; and graduate students honored Becky Collins, dean, Nursing Division, Greenville Technical College.

Other College Activities

The “Living Well” weekly newspaper column, written by faculty and students in the college, received a Public Media Award at a regional Sigma Theta Tau Assembly (Honorary Society for Nursing). This column, consisting of information about prevention and treatment of disease and maintenance and promotion of wellness, is being distributed to more than 50 weekly and seven daily newspapers and to numerous individuals and agencies throughout the nation. These columns have been adapted to 60-second radio productions that can be heard on 34 different radio stations throughout South Carolina.

This spring a doctoral student in nursing from the University of Texas served an internship in educational administration in the College of Nursing. During the internship, this student developed a model for long-range planning in nursing education programs. Currently, this model is being used by the college to develop a five-year plan to guide the college’s growth and development within the last half of the decade of the 80s.
The College of Sciences continues to attract a gradually increasing number of majors due to the continuing interest on the part of students in the areas of preprofessional health, environmental concerns and energy-related problems. The area of computer science is beginning to level off, probably due to a better understanding by the applicants of the nature of the discipline.

The College of Sciences continues to be responsible for 30 percent of the total University teaching load due to a high percentage of undergraduates majoring in engineering and other technically related subjects.

Although the availability of external funds for research continues to decline on a nationwide basis, the faculty of the College of Sciences continued to increase its share of those funds during the 1984-85 fiscal year, with the total value of all grants and contracts in force exceeding $8 million. This represents an increase of more than $4 million from the comparable figure for the 1980-81 fiscal year. Of particular importance is the fact that our ratio of externally generated grant and contract funds to the State funds expended by the college in attracting this support continues to be the highest in the University, that ratio being 3.75:1 for 1984-85.

The Electron Microscope Facility in the College of Sciences, through a major grant to Dr. Jay Lathrop in the Department of Electrical and Computer Engineering, now has an Auger Microprobe and a scanning electron microscope with state-of-the-art attachments permitting very sophisticated surface measurements. This equipment from the Semiconductor Research Corporation has made this facility unquestionably one of the 10 best in the nation.

**Biology Program**

During the 1984-85 academic year, approximately 4,500 students were enrolled in courses offered by the Biology Program. Eight lecture sections and 58 laboratory sections per week were taught by faculty and graduate students from the Biology Program and departments of Microbiology and Biological Sciences.

The Science Learning Resources Center, which houses both audio-visual and microcomputer materials, was used successfully by several lecture and laboratory sections of students. Using the computer-based Teacher Information Processing System, it is possible to pair individual students with audio-visual and computer materials appropriate for their level of ability and mastery of the subject matter being taught. Data collected on users and non-users indicated that most students were able to improve their grades by 15 points or more by diligently using the Learning Resources Center.
The Sixth Clemson University Biology Merit exam was conducted for more than 1,100 high school and junior high school students. Top winners were awarded scholarships to Summer Science Camp through a grant from the Alumni Foundation Fund.

The Biology Program faculty continued its involvement with teacher education in South Carolina, offering two science courses for elementary teachers, an advanced biology course for high school teachers and a summer institute program for middle school life science teachers. The faculty presented 10 laboratory exercise workshops at the South Carolina Science Council meeting and distributed laboratory packets to South Carolina teachers. The faculty also developed and ran a program for minority students and teachers in conjunction with the South Carolina Academy of Sciences.

Notable activities of the Biology Program faculty included receipt of a $2.2 million National Science Foundation grant in conjunction with the University of South Carolina and the Charleston Consortium. The grant is a three-year program in teacher education in the areas of science and mathematics. A second faculty member received a $184,000 grant from the National Science Foundation to develop computer software in biology. One faculty member served as the director of the Junior Academy of Sciences for the State of South Carolina and another served as the president of the South Carolina Association of Biology Teachers.

Additional activities included presentation of two papers at annual meetings of the National Science Teachers Association and National Association of Biology Teachers; direction of a symposium in computer education in biology at the regional National Science Teachers Association; organization and direction of the Junior Academy of Science Winter Workshop and Science Olympics; judging the South Carolina Junior Academy paper presentations; judging the western regional science fair and other state science fairs.

Four manuscripts were published, and four laboratory manuals were revised and published.

Department of Biological Sciences

The Department of Biological Sciences was formed on July 1, 1983, by the merger of the departments of Biochemistry, Botany and Zoology. In the fall of 1984, the department had 175 students enrolled in undergraduate degree programs (71 in biochemistry, four in botany and 100 in zoology). We also had 26 M.S. students (two in biochemistry, seven in botany and 17 in zoology) and 44 Ph.D. students (six in biochemistry, four in botany enrolled under the program in plant physiology in the College of Agricultural Sciences, and 34 in zoology). The doctoral program in zoology continues to serve the largest group of Ph.D. students at Clemson. During the 1983-84 academic year, the department awarded 31 B.S.
degrees (11 in biochemistry, four in botany and 16 in zoology), seven M.S.
degrees (one in biochemistry, two in botany and four in zoology) and
seven Ph.D. degrees (all in zoology).

Research and training activities were supported by 16 grants and
contracts: four each from the National Science Foundation and U.S. Army
Corps of Engineers, two from E.I. DuPont de Nemours & Co., and one
each from the Electric Power Research Institute, the U.S. Forest Service,
the U.S. Army Medical Research program, Radio Corporation of Amer­
ica, the American Heart Association and South Carolina Sea Grant
Consortium. Four faculty members also were awarded seed-time for use
of the Electron Microscope Facility, and three grants were received from
the Faculty Research Committee of Clemson University. One faculty
member was awarded a Provost's Award for his scholarship, and one
received a grant from the National Geographic Society. Since 1974, the
collective departments have received more than $3.8 million to support
their research and graduate training activities.

Scholarly activities by faculty and students during the year included
papers presented at one international meeting and more than 48 papers
delivered to national and regional meetings of scientific or professional
societies. Thirty-three scientific papers, one book, six book chapters, one
patent application and 45 abstracts, reviews or notes were published or are
in press. One graduate student received a Graduate Research Fellowship
at the Savannah River Ecology Laboratory. Four graduate students
received awards from Sigma Xi and two received funds from the Lerner­
Gray Fund for Marine Research and the Slocum-Lunz Foundation. Our
faculty includes one Rhodes and one Danforth Scholar. This year, John P.
Wourms was awarded the first Guggenheim Fellowship to be received by
a faculty member at Clemson.

Professional and service contributions by members of the faculty
included the following activities: chairman, Heritage Trust Advisory
Board of South Carolina; second president elect, Animal Behavior Soci­
ety; Board of Scientific Advisors (two faculty members, one serving as
chairman) and Board of Trustees and member of the Executive Commit­
tee of the board of Highlands Biological Station; Board of Governors of
the South Carolina Aquatic Plant Management Society; member of the
University, State and District Selection Committees for the Rhodes Schol­
arship Trust; associate editors for the Transactions of the American
Microscopical Society, the Journal of Experimental Zoology and the
Journal of Environmental Biology of Fishes; and technical editor of the
Journal of the American Killifish Association. Lawrence A. Dyck is vice
president of the Faculty Senate, and a number of our faculty members
served on commissions and other university, college and departmental
committees.

Faculty members of the department gave seminars at 15 other institu­
tions. One seminar was presented by a Clemson faculty member outside our department. Our doctoral graduates all presented dissertation seminars as a part of their defense. Thirteen outside speakers visited our campus to present seminars. A number of informal presentations also were made as part of our brown-bag seminar series by faculty and students. Seminars are an integral part of our training program and serve to acquaint others with our facilities and activities while promoting the exchange of information and ideas.

The vertebrate museum and herbarium continue to support our teaching, research and service roles. The Field Station is used in a number of training and research activities and the Greenhouse and Animal Room Facility are important to our integrated program.

During the year, the faculty approved a B.S. and a B.A. curriculum in Biological Sciences to replace current degree programs in botany and zoology. These degrees should be available by the fall of 1986. Courses related to these changes and several new offerings in the areas of industrial and regulatory biology were also approved. During the coming year, we hope to refine and revise other offerings and will consider a merger of graduate degree programs to reflect the modern unified thrust of the life sciences. The department remains committed to broad-spectrum training of undergraduates and graduates, an active and relevant research program, and service to the profession and state.

**Department of Chemistry and Geology**

The year was highlighted by the beginning of construction on the new chemistry building and the acquisition of three outstanding new faculty, including the first black faculty member in the history of the department.

Construction of the new 100,000-square-foot building is on schedule and should be completed in April 1986. Occupancy will be in the summer of 1986. Final plans are under way for furnishing the facility, which will include major new equipment for teaching and research.

New faculty hired are Dr. R. Karl Dieter in organic chemistry (Ph.D. Univ. of Pennsylvania) who has already compiled an impressive record as a junior faculty member at Boston University, Dr. Joseph W. Kolis in inorganic chemistry (Ph.D. Northwestern Univ.) and Dr. Gregory H. Robinson in inorganic chemistry (Ph.D. Univ. of Alabama). All have one or more years of postdoctoral experience, and they will add considerable breadth to the chemistry program. They join a dynamic faculty, whose average age has decreased since 1980, and bring the total new faculty hired since that time to 10.

Eleven B.A. and B.S. degrees were awarded in the academic year 1984-85, along with six M.S. and six Ph.D. degrees. While the number of undergraduate degrees declined from the previous year, the number of graduate degrees increased. The total number of majors in geology (approx. 30) and chemistry (approx. 100) remained level, but those
reaching senior status have declined. Graduate enrollment in chemistry continued strong with more than 45 students in residence. Overall enrollments in the department increased, and more than 1,900 students were enrolled in freshman level courses in the fall.

Outstanding undergraduate student Aristotle George Kalivretenos graduated summa cum laude in chemistry and was the recipient of a Michelin Fellowship for research and study in France in the spring of 1985. He will attend Colorado State University to study for his Ph.D. degree in chemistry.

Recognition of faculty research efforts included more than a half million dollars in new research grants and invitations to lecture in China, Brazil, Australia and such prestigious universities as the California Institute of Technology, Stanford University and the University of California, Berkeley. The 1985 Clemson Alumni Association award for outstanding research was given to chemist and department head Dr. Darryl D. DesMarteau.

Department of Computer Science

The Department of Computer Science began to stabilize during the past year, following several years of rapid growth. The number of majors increased slightly to approximately 500 undergraduates and 80 graduate students. There were 86 B.S. graduates and 19 M.S. graduates, an increase of 27 B.S. and 16 M.S. degrees over the previous year. Demand for our graduates by employers continued to be very strong.

The new Ph.D. program in computer science was initiated during 1984-85. Four students were enrolled in this program.

Externally funded research continues to increase, and the department continues to enjoy a level of funding of about $1 million annually. Departmental faculty members published 12 refereed papers and also made numerous conference presentations.

Space continues to be a serious problem. The department has completely outgrown the available space in the College of Nursing Building, and the lack of space will severely limit our ability to perform effectively during the coming year. Current plans to provide additional space by completing the unfinished basement of Jordan Hall will provide sufficient space for the next two or three years if these plans are carried out. Faculty recruiting also continues to be a serious problem. The department was unsuccessful in filling all three of its available permanent positions during the past year, continuing the trend that has been established during the past several years.

Department of Mathematical Sciences

The undergraduate credit-hour production of the Department of Mathematical Sciences continued to be more than one-eighth that of the
entire University, and the doctoral level credit-hour production of the department was approximately one-tenth that of the University.

Twenty-eight students who majored in baccalaureate degree programs and 17 students who majored in master's degree programs of the department received degrees along with five students whose doctoral dissertations were directed by faculty of the department. In spite of national trends to the contrary, the department had more than 200 undergraduate majors and continued to attract high quality graduate students who have received degrees from colleges and universities in the United States.

Contracts and grants in force in the department during 1984-85 amounted to $703,000. Included in this amount is the 15th year of funding of the department's Office of Naval Research Contract and a five-year, eight-participant National Science Foundation EPSCoR grant in discrete mathematics. Additionally, the department continued its long tradition of service to precollege education by securing extra-University funds to support 22 teacher-training courses in mathematical sciences.

The department welcomed to its faculty four new members, including one who joined as professor. One of the four vacancies on our faculty was caused by the retirement of one of its members. One member of the faculty was installed as fellow of the American Statistical Association. Another conducted research in West Germany supported by his second Humboldt Research Fellowship, the West German equivalent of the American Fulbright Fellowships. A third member of our faculty has been appointed chair of the Academic Affairs Council for the College Board, the highest advisory position in the College Board. A fourth member is visiting the Radiation Effects Research Foundation in Hiroshima, Japan, as a statistical consultant invited by the National Academies of Science and Engineering.

Medical Technology Program

The Medical Technology Program is now into its third decade. Mariette V. Ruppert, assistant professor of biology, has been coordinator of the program since last spring when Muriel B. Bishop, professor of chemistry, stepped down. The program has continued to thrive this past year.

Among other business transacted by a smoothly functioning Medical Technology Committee was a recommendation for two curriculum changes. These changes have been approved at all levels of the University and are now in place. The current coordinator has promoted the program by several presentations about medical technology this year to groups of teachers and students from around the state and by participation in events sponsored by the State chapter of the national professional association and by attendance at the annual national meeting.

The student Medical Technology Club has completed a very active and successful year including trips to area hospital labs, presentations by
speakers, and participation in other professionally oriented events such as attending State professional society meetings.

Eleven students completed the baccalaureate degree requirements in medical technology in 1984-85, bringing to 130 the total number of graduates in this program. Forty-two students are currently enrolled in the program. Our students have continued to make excellent scores on the national certification exams and have all been successful in finding employment in the field.

**Department of Microbiology**

The department has had a successful year with both its teaching and research programs. There were approximately 120 undergraduates majoring in the microbiology B.S. curriculum and 28 students enrolled in graduate programs, 14 of whom were pursuing the doctoral degree. During the 1984-85 year, 16 B.S., six M.S. and one Ph.D. degree(s) were awarded. The recipient of the Ph.D. degree accepted a teaching position where she was elected teacher of the year. Graduates from the M.S. program were employed by industry or continued training in doctoral programs. B.S. graduates entered a variety of positions with industry and research organizations, continued with graduate education, or were admitted to professional health programs in medicine, dentistry or pharmacy.

Funds provided by a grant from the Department of Defense (DoD) have been used to purchase a preparative ultracentrifuge and related equipment. These and other state-of-the-art tools have been used in a number of research projects under way in the department.

Faculty have been successful in obtaining external funds to support their research and the graduate programs. Grants and contracts are funded by Sea Grant, National Cancer Institute, Army Research Office and U.S.D.A. Areas of research have included: biological fixation of nitrogen by bacteria associated with the roots of sea-grasses, bacterial diseases associated with marine fish, studies at the molecular and genetic levels of enzymes capable of digesting cellulose at elevated temperatures, characterization of the cellulose digesting enzyme system produced by a marine bacterium, degradation of herbicides in aquatic sediments, biogenesis of methane gas, genetic engineering of bacteria and yeast to produce chemical products of economic value, studies of melanoma cancer cells, molecular studies of cancer-causing chemicals with DNA, molecular studies with bacterial viruses, and enzymes that destroy the natural immunity factors against a bacterium responsible for dental caries.

The faculty have presented papers and chaired sessions at national and regional meetings of the American Society for Microbiology, and published research articles in refereed journals. One faculty member has
returned from sabbatical in New Zealand. Another will spend the next year in England where he will continue his research and teach in the medical school at the University of Birmingham.

**Department of Physics and Astronomy**

Programs in Physics and Astronomy received support from a variety of sources this year. These included the National Science Foundation, the National Aeronautics and Space Administration, the Air Force Office of Scientific Research, the North Atlantic Treaty Organization, Research Corporation, Fiber Industries and the Army Corps of Engineers. Two of our faculty members were recipients of Provost Research Grants while another received support from the University Research Committee.

The international exposure of our programs continues to increase. Our faculty visited Denmark, Germany, Switzerland, Italy, France, England, Israel and Yugoslavia to lecture on their research. Visitors to our department from India, France, Germany and England learned of our research during their stay. Both are indicators of the level of excellence which our programs have attained.

Our interaction with neighboring high schools and colleges increased dramatically this year. Our annual Physics Day attendance nearly tripled. Since its inception three years ago (when attendance was zero due to snow) we have reached almost the 300-person mark, meaning that high school students have a better opportunity to see physics and astronomy as they are being done. This makes these subjects more realistic as career options, a very important result for our society since nearly 60 percent of the physics majors in this country are foreign students. A feature of the Physics Day was several presentations of Physics of Toys, a nationally recognized program developed by one of our faculty members, who made several presentations of this material at national conferences.

Our teaching programs received additional recognition when one of our faculty members was selected as an associate editor of the *American Journal of Physics*. This journal — devoted to physics pedagogy — has the highest circulation of any physics journal in the world, appearing in research libraries, college libraries and even high school and municipal libraries. Another faculty member has been named to the Educational Testing Services panel for test design.

A major honor for our research programs was the selection of our department head as the Clemson University Sigma Xi "Outstanding Research Scientist" for 1984-85. Another faculty member was honored as the recipient of the first Clemson University "Outstanding Faculty Woman" during Women's History Week.

Our undergraduate laboratories continue to come "on line" with microcomputerization. A new laboratory course has been introduced to parallel the introductory mechanics course. A second new course on microcomputer interfacing also has been introduced.
GRADUATE SCHOOL

The 1984-85 academic year saw continued improvements and growth in services derived from the Student Data Base (SDB). Academic departments possessing proper computer terminals now have access to the records of all graduate students in a particular academic major. This effort has paid immediate dividends both in improved response to applicants and in a decreased flow of paper between the Graduate School and the departments.

Enrollment for the fall semester was 2,473 students, including 171 enrolled in the Clemson-at-Furman MBA degree program. The total enrollment in degree programs was 1,916 with 381 in doctoral programs, both record high numbers.

Advanced degrees awarded during the year totaled 563, including 49 Ph.D. degrees.

Eighty-seven students received a fellowship of some type. These represent over 8 percent of the 1,041 full-time students eligible for such awards. Especially pleasing was the implementation of the two H. W. Close Fellowships of $12,000 each, given by Springs Industries of Fort Mill, S. C. These renewable fellowships, named in honor of the former chairman of the board of Springs Industries, are awarded annually to two outstanding students entering master’s programs in the College of Commerce and Industry and in another of the University’s colleges.

Seven hundred and twenty graduate students, or 69 percent of those eligible, received some type of graduate assistantship requiring service to the University.
UNDERGRADUATE STUDIES

The Undergraduate Studies Office is responsible for undergraduate academic programs and curricula, academic standards, scholarships and awards, Universitywide lectures, new faculty-staff orientation, summer sessions, the Clemson Career Workshops, the Honors Program and special graduate scholarship programs.

The Clemson Career Workshops bring academically outstanding minority students to campus before their junior and senior years in high school. The 1984 program included 345 students at both levels, and the 1985 program 321. Clemson expects 56 new freshmen recruited by this program to enroll in the fall of 1985.

The Honors Program enrolled 4 percent of the undergraduate student body in 1984-85, and 23 students (doubled from the previous year) were graduated with Senior Departmental Honors in May and August. Among the special graduate scholarships, three Clemson seniors received Fulbright scholarships for foreign country study in 1985, bringing the number to 20 in the past six years.
OFFICE OF UNIVERSITY RESEARCH

The Office of University Research provides information and assistance concerning all aspects of the University research effort to faculty members, departments, colleges and other administrative units. The office helps prepare and submit applications for sponsored research, instruction and public service programs. During 1984-85, the office processed 616 faculty proposals.

The office also provides University liaison between the institution and all public and private, national and local organizations or entities concerned with any aspect of research support, regulation or administration.

Guidance and executive support were provided to the University Committee for the Protection of Human Subjects (36 active projects); the Biomedical Research Support Grant Committee; the University Research Grant Committee (31 faculty grants, 25 Provost Research Awards); the Committee for Laboratory Animal Welfare; the Institutional Biosafety Committee (1 active project) and the Clemson University Patent Committee (11 patent disclosures processed).
THE STROM THURMOND INSTITUTE OF GOVERNMENT AND PUBLIC AFFAIRS

The Strom Thurmond Institute is the main program component of The Strom Thurmond Center for Excellence in Government and Public Service, which comprises a planned institute and archives building, a multi-purpose auditorium facility and a continuing education building. The Thurmond Center is funded entirely by private contributions and will make possible an endowment to support the six programs of The Thurmond Institute:

- The Thurmond Seminars in Government and Politics
- The Strom and Nancy Thurmond High School Achievement Program
- The Thurmond Scholars Program
- The Institute Lecture Series
- The Institute Distinguished Lecturers Program
- The Institute Governmental Research Program

Since its inception in July 1982, the Institute has sponsored public programs featuring a number of leading opinion makers addressing such subjects as the proposed balanced budget amendment, nuclear arms freeze, El Salvador, improvement of public education, farm and food policy, and civilian-military cooperation in defense research and engineering. Speakers featured have included Sen. and Mrs. Thurmond; Sen. Patrick Leahy, D-Vt.; Dr. Edward Teller; U.S. Rep. Michael Barnes, D-Md.; Dr. Helen Caldicott; Secretary of Commerce Malcolm Baldridge; Prime Minister Eugenia Charles of Dominica; Ted Turner; John Connally; Undersecretary of Defense Richard DeLauer; Admiral Hyman Rickover; and members of the Clemson University faculty.

The Institute has ongoing governmental research programs in state and local government, volunteerism and civic participation, and defense studies. The Institute has a major research contract with the State of South Carolina to develop a long-range water policy for the State. The study involves six departments at Clemson University and two departments at the University of South Carolina.

The Institute publishes a lecture series, working papers on a variety of public subjects and proceedings of other programs it sponsors.
CLEMSON UNIVERSITY LIBRARIES

The highlight of 1984-85 for the Clemson University Libraries was the public unveiling of LUIS. For the first time, users of the libraries had access to the on-line catalog from terminals located within and without the Libraries. By the end of 1984-85, more than 1,000 terminals on and off campus had the capability to access LUIS.

Collections

The Libraries' material budget was increased during this fiscal year to help cover the increases in subscription costs for periodicals. This increase allowed the Libraries to maintain all its subscriptions and spend nearly $400,000 for monographic materials, the most spent in the past five years.

In addition to increased allocations to the budget, the Libraries received more than $100,000 in private funds, the bulk coming from the successful "Bookplate" mailer campaign conducted by the Office for Development.

During the year, 162 new periodical subscriptions were added, continuing a turn-around from just two years before when 600 subscriptions had to be cancelled. We have an immediate need for an additional 300 subscriptions. Subscriptions are particularly needed in the areas of business, robotics, computer-assisted design, computer-assisted manufacturing and computer-assisted engineering.

As noted above, spending for books increased 23 percent. New approval plans were initiated and old ones expanded, thus enabling the Libraries to receive newly published materials at a much faster rate. We receive materials on approval in a number of areas, including arts, history, geography, education, economics, political science, agriculture and forestry.

A collection highlight was the addition of the Department of Energy technical report collection. Clemson University Libraries was chosen as the only library system in the State to receive a complete file of this collection. The Energy Research Center was extremely helpful by providing funds for student assistants to put this massive file (135,000 reports) in order. Using this collection as a base, the Libraries is putting emphasis toward the acquisition and organization of a technical report collection. In addition to technical reports from the Department of Energy, technical reports from NASA, Department of Defense, Environmental Protection Agency and the Nuclear Regulatory Agency are received.

More than 1,000 gift volumes were received during the year. The receipt of gift material continues to be a valuable source for collection development for the Libraries.

During the year, the Libraries received commitments for several manuscript collection donations. Mr. James R. Mann, former member of
Congress from Greenville, who served on the House Judiciary Committee, has agreed to donate his papers to Clemson University Libraries. The five immediate past directors of the National Park Service also have agreed to donate their papers, which will provide researchers with the documentation of the chief executive officers of the National Park Service for the past 25 years. This collection will benefit researchers in the Department of Parks, Recreation and Tourism Management. Another significant collection received was that of Nancy H. Steorts. Ms. Steorts' papers cover the period she was chairman of the Consumer Product Safety Commission under President Reagan and when she served in the Department of Agriculture.

A major policy activity was the review of the Libraries' Collection Development Policy adopted five years ago. This policy not only stipulates the types and quantities of library materials the Libraries purchases, but also defines the level of collection development by subject area. During the year, the majority of the review was completed.

Automation

Implementation of the NOTIS software continued throughout 1984-85, and several milestones were achieved. Use of the system for cataloging the entire year provided substantial evidence of the system's viability for the control of bibliographic and related information for the Clemson University Libraries. More than 60,000 bibliographic records were added to the Libraries' database this year. We now have approximately 70 percent of the Libraries' collections converted into machine readable form and available on the on-line catalog, LUIS. In addition, the database was heavily used by staff in the acquisition of new materials. Bibliographic records for all the current serial subscriptions were entered into the database this year, and staff began to use these records for check-in of current issues in the late fall. Orders for new titles have been routinely handled by NOTIS for several months. Refinement of use for acquisitions and serials control will continue over the next year.

A major aspect of the NOTIS system, the public use module, LUIS, was introduced in January. LUIS provides users with on-line access by author, title and subject to the entire database of records from terminals in the Libraries as well as hundreds of terminals on and off campus. Publicity for the introduction of LUIS was supported by the efforts of the University Relations staff, who developed an introductory campaign, which included a cartoon character to represent LUIS. Student awareness, as well as use by faculty, of the system has been dramatic. LUIS is searched several thousand times a week by terminals located in every corner of the campus.

Response to the system on campus has been enthusiastic, and special training programs have been introduced to improve the potential success
of users searching the database. LUIS will continue to be improved by design changes under way, as well as by implementation of the circulation module. The next major project with NOTIS will be the introduction of the circulation system early next year, for which planning is under way.

During the spring, NOTIS began to make its first visible reduction in costs of providing cataloging information when our Cataloging Unit was able to quasi-close our card catalog, saving more than $30,000 each year in catalog maintenance costs.

**Records Management/University Archives Grant**

The Clemson University Libraries was awarded a $50,000 grant from the National Historical Publications and Records Commission to establish a records management program for the University and to strengthen the capabilities of the University Archives. The first year of this two-year grant will be devoted to the establishment of the records management program. A records analyst has been appointed and will begin working with the records of the Office of the President and two of the colleges.

Reversing a trend that has been local as well as national, the circulation of the Libraries' materials increased during 1984-85 by 10 percent. This reversal was matched by an increase in students who had their Student ID's validated, permitting them to borrow material from the Libraries. During the previous two years, this number had been declining, reaching the level where only half our students could borrow library materials. In 1984-85 these numbers increased rather than declined, with 57 percent of our students eligible to borrow materials from the Libraries.

Related to the increase in the number of items circulated is the increase in the number of items borrowed on interlibrary loan from other libraries, indicating that our users were able to secure materials needed. The number of reference questions and research questions also increased, the latter by more than 50 percent. While the number of on-line data searches remained constant, plans are being made to provide a self-service searching capability at night using systems with limited databases. The introduction of this service, although limited in scope, will be free and should generate greater demands for our full on-line search services.

**Facilities**

The addition of 442 square feet in the Sirrine Library allowed the library to add 35 more sections of shelving and reading tables and chairs.

The Gunnin Architectural Library gained use of the corner room, which had been promised for more than four years. During 1984-85 the room was cleared and made available to the library to house planning documents and maps. This library continues, however, to be short of space. During the next fiscal year, additional stack space must be added to the few remaining square feet available. Thereafter, the size of the library
collection will have to be restricted unless additional space is found.

Both Sirrine and Gunnin libraries received terminals to the NOTIS system during the year. In addition, both libraries received Apple Macintosh microcomputers to assist them in the administrative aspects of their operation. Both libraries also received new photocopy machines operated by magnetic cards.

In the Robert M. Cooper Library, as well as the branches, a graphic system was finalized. The new signs will replace a hodge-podge of handmade signs used throughout the Libraries. We believe that the atmosphere of the Libraries has changed appreciably with the addition of the new graphics system.

**Personnel**

This was the first year the Libraries participated in the management trainee desegregation program. During the year, the Libraries appointed a school librarian, Ms. Freddie Bush, as its business/textile reference librarian trainee. All involved in the successful program, which developed a novice into a capable academic librarian, found it a very rewarding experience. Ms. Bush is now a member of the regular library faculty.

A number of the Libraries faculty members have been active professionally during the year. Two of the sections of the South Carolina Library Association, Government Documents Roundtable and the College and University Section were chaired by members of the Clemson Libraries faculty. Others served on committees and sections of the American Library Association and other specialized associations.

A number of staff members received CPR training during the year. About 25 members of the staff, primarily from the public service units of the Libraries, attended an in-house workshop on assertiveness and public relations. The workshop was conducted by Ms. Rosemary Gaillard from Queens College in Charlotte.

**Conclusion**

This has been a good year for the Libraries, with a number of successes on several fronts. Planning for several additional improvements during 1985-86 has begun. The addition of the circulation module and the completion of the acquisitions and serials modules will signal the completion of NOTIS for the short term. Completion of the retrospective conversion project and future enhancements and the eventual replacement of the integrated system will keep the staff busy for years to come.
## STATISTICS

### Collections

<table>
<thead>
<tr>
<th>Books and Journals</th>
<th>Accessioned</th>
<th>Withdrawn</th>
<th>Cataloged</th>
<th>Total (6/30/85)</th>
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</thead>
<tbody>
<tr>
<td>Cataloged (all libraries)</td>
<td>20,628</td>
<td>2,131</td>
<td>19,249</td>
<td>616,964</td>
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**Uncataloged:**

<table>
<thead>
<tr>
<th>Library</th>
<th>Total</th>
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<tbody>
<tr>
<td>Gunnin</td>
<td>4,884</td>
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<tr>
<td>Sirrine</td>
<td>3,027</td>
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<td><strong>TOTAL</strong></td>
<td><strong>624,875</strong></td>
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### Documents and Reports

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<tbody>
<tr>
<td>Cooper</td>
<td>584,058</td>
</tr>
<tr>
<td>Gunnin</td>
<td>1,831</td>
</tr>
<tr>
<td>Sirrine</td>
<td>1,371</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>587,260</strong></td>
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### Microforms

<table>
<thead>
<tr>
<th>Type</th>
<th>Microfilm</th>
<th>Microfiche</th>
<th>Microcard</th>
<th>Vol. Equiv.</th>
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<tbody>
<tr>
<td>Public Documents</td>
<td>2,228</td>
<td>408,407</td>
<td></td>
<td>83,909</td>
</tr>
<tr>
<td>Other</td>
<td>18,169</td>
<td>447,652</td>
<td>31,449</td>
<td>113,989</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>20,397</strong></td>
<td><strong>856,059</strong></td>
<td><strong>31,449</strong></td>
<td><strong>197,898</strong></td>
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</table>

**GRAND TOTAL PRINTED MATERIALS:** 1,410,033

### Slides (Gunnin)

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td></td>
<td>64,618</td>
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### Maps (Cooper)

<table>
<thead>
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<th></th>
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<tr>
<td></td>
<td>28,065</td>
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### Current Serial Subscriptions

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<tr>
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<th>1984/85</th>
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</thead>
<tbody>
<tr>
<td>Periodicals</td>
<td>5,268</td>
<td>5,361</td>
</tr>
<tr>
<td>Other Serials</td>
<td>1,104</td>
<td>1,081</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>6,372</strong></td>
<td><strong>6,442</strong></td>
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### Circulation

<table>
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<tr>
<th>Year</th>
<th>1983/84</th>
<th>1984/85</th>
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<tbody>
<tr>
<td>Door Count of Users</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooper</td>
<td>714,825</td>
<td>772,975</td>
</tr>
<tr>
<td>Gunnin</td>
<td>35,789</td>
<td>40,236</td>
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<tr>
<td>Sirrine</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>750,614</strong></td>
<td><strong>813,211</strong></td>
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### Books Circulated

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<tr>
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<th>Total</th>
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<tr>
<td>Cooper</td>
<td>190,991</td>
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<tr>
<td>Gunnin</td>
<td>12,911</td>
</tr>
<tr>
<td>Sirrine</td>
<td>8,662</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>212,564</strong></td>
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</tbody>
</table>

### Reference Services

<table>
<thead>
<tr>
<th>Type</th>
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<th>1984/85</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inquiries</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Directional</td>
<td>8,948</td>
<td>7,660</td>
</tr>
<tr>
<td>Reference</td>
<td>29,214</td>
<td>35,506</td>
</tr>
<tr>
<td>Research</td>
<td>324</td>
<td>488</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>38,486</strong></td>
<td><strong>43,654</strong></td>
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### Computer Searches

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<thead>
<tr>
<th>Type</th>
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<th>Count 2</th>
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</thead>
<tbody>
<tr>
<td>Quick</td>
<td>67</td>
<td>54</td>
</tr>
<tr>
<td>Reference</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Research</td>
<td>307</td>
<td>316</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>388</strong></td>
<td><strong>380</strong></td>
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### Interlibrary Loans

<table>
<thead>
<tr>
<th>Type</th>
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<th>Count 2</th>
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</thead>
<tbody>
<tr>
<td>Loaned</td>
<td>4145</td>
<td>3887</td>
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<tr>
<td>Borrowed</td>
<td>3217</td>
<td>3931</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>7362</strong></td>
<td><strong>7818</strong></td>
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</tbody>
</table>
Computing Services

Computer Center

In 1984-85 plans were implemented that will set the direction for computing at Clemson for the next five years. The Computer Center published long-range plans for development of a sophisticated network that would incorporate mainframe, mini- and microcomputers; office automation services; and access to off-campus computers and networks. The basic network to provide such services was in place and available for use in June 1985. It remains unclear, however, whether or not adequate space, power and air conditioning will be made available to the center to house the equipment, or if personnel necessary to meet the anticipated demand for computing services will be added.

The Computer Center’s activities are divided into three major components, each with its own budget. First, and by far the largest, are the services revolving around the IBM mainframe computer. Second are network and computing services provided by DEC VAX computers. Third, microcomputer services include provision and supervision of microcomputer laboratories. The center’s long-range plans address these three major areas and their interrelationship.

The IBM system remained relatively unchanged during 1984-85. A continuing shortage of machine room space necessitated a replacement of old tape drives with newer models taking up less space and using less power. The number of disk drives installed was minimized by allowing academic users no more disk space than they had in 1983-84. Administrative disk space was permitted modest growth; the new online library catalog system being one major new application requiring additional storage space. The number of terminals attached to the IBM system continued to increase, despite the acquisition of numerous microcomputers on campus. This shows no signs of decreasing in future years. The IBM 3081 computer has lasted longer than any previous computer the University has owned and can be expected to last through 1985-86 before a replacement will be necessary, unless there is an unexpected surge in demand.

The VAX network, though under-funded in 1984-85, was expanded to include a computer running the UNIX operating system for use by faculty and students. Of greater long-term interest, though, was the expansion of network services to provide access to off-campus computers and networks, and to national and international electronic mail services. Through the network, Clemson researchers now have remote access to supercomputers in various parts of the country, something which previously had been possible only by visiting the computer sites in question. Access to national and international electronic mail services put researchers and administrators at Clemson in contact with their counterparts at other
institutions in a convenient and inexpensive manner. The network also has been designed to maximize the use of terminal equipment by including the requisite hardware and software to permit any workstation on the network to efficiently access any computer on the network, whether or not it is directly connected to that computer.

The Computer Center's first microcomputer laboratory, consisting of 50 DEC Rainbow microcomputers connected into the VAX network, was opened in the Library in late 1984. A second laboratory of 25 Rainbows was opened in Daniel Hall a few months later. Construction is under way on two other microcomputer laboratories in Lowry and Sirrine halls. These latter are to contain IBM PCs. Twenty Texas Instruments microcomputers have been temporarily housed in Martin Hall while space is renovated in their permanent location in Lee Hall. The demand for publicly available microcomputers is expected to continue to increase, probably at a rate equal to or greater than that for terminals. Additional microcomputer laboratories are planned.

The center published a University office automation strategy which was accepted by the administration. In essence the plan calls for the installation within three years of a campuswide office automation system consistent with State and University standards. The network will be operated and maintained by the Computer Center with departments responsible for their own workstations and output devices connecting to the network. This plan is moving ahead with the installation of networked office automation systems in the computing divisions, the College of Engineering, and the College of Forest and Recreation Resources.

The center's greatest problem, other than a lack of committed level of equipment funding, continues to be the shortage of space, power and air-conditioning. The increased demands for computer and computer-related services necessitate increased space for staff and for equipment. Such space does not exist at the Computer Center. It appears that a partial solution may have been found by allocating the basement of Lehotsky Hall to the center and moving some of the center's divisions from the Plant and Animal Science Building to Lehotsky. However, this space would have to be renovated, which could not be completed before the 1986-87 academic year. Unfortunately, funding has not been obtained to renovate the vacated portion of the basement of the Plant and Animal Science Building to make it suitable for housing computer equipment. Until this is done, the center will have the same problems regarding equipment expansion that it has had for the past several years.

The Computer Center's plans for the future were clearly defined in 1984-85, and significant progress was made toward implementing those plans. However, the space issue remains a serious problem to be addressed if the center is to continue to efficiently meet the computing needs of the University.
Division of Administrative Programming Services

The Division of Administrative Programming Services (DAPS) develops and maintains computerized information systems for the University. The Division also helps administrators in all departments retrieve information from administrative databases in a form that is meaningful and specific to the problem. A key component of DAPS' mission is to design coordinated information systems supported by an integrated University database using standardized data definitions. During 1984-85, DAPS accomplished the following tasks:

1. Helped install the NOTIS library system for the R.M. Cooper Library. Components now in place are the on-line card catalog (LUIS), cataloging and acquisitions.
2. Implemented an artificial intelligence software system (INTELLECT) for administrators to retrieve information using English language statements. Areas using INTELLECT include Student Affairs, the Personnel Division and Alumni Affairs.
3. Implemented an employee leave recording and accrual system. This facility is used by departments to process leave for employees and to retrieve detail and summary reports concerning leave.
5. Helped several departments select and install microcomputers for administrative use and for processing data from administrative systems.
6. Provided software support for the spring and fall budget processes.
7. Programmed the third major phase of the Student Database, a Financial Aid and Collections System. This phase will be installed during the last part of 1985.
8. Implemented an on-line property inventory system used for University fixed assets as well as smaller items tracked by individual departments.
9. Designed and implemented the Departmental Access System that allows academic advisers, department heads and deans to retrieve student transcript information for appropriate majors from terminals in offices.
10. Helped select the Paciolan software/hardware system being installed in the Athletic Department.
11. Enhanced the Alumni and Development data systems to include pledge processing and other new features.
12. Designed a University Vehicle/Traffic System to be installed during next fiscal year.
13. Developed and tested an electronic funds transfer capability for payroll checks.
15. Expanded financial systems to make them more accessible by authorized persons campuswide.
16. Upgraded the software used by DAPS to develop administrative systems, including the database management system used (IDMS) and the teleprocessing monitor (IDMS/DC).
17. Maintained the effectiveness and ongoing operation of 60 administrative systems and responded to requests for enhancements as prioritized by major users.
18. Supported the use of data retrieval languages such as SAS and CULPRIT by administrative staff.

Division of Information Systems Development

The Division of Information Systems Development (DISD), which provides computer systems development and consultation services under contract primarily to non-Clemson University customers, experienced a year of significant growth in 1984-85. Revenue increased approximately 50 percent in the wake of several new, substantial contracts, and the accompanying increase in staffing levels has provided employment opportunities to a number of Clemson graduate students who could benefit from practical experience in the computing field.

A major new contract currently running at its peak of activity is for the development of a comprehensive, on-line, administrative software system for the State’s 16 technical colleges. The student records portion of this system has been completed, installed and accepted by the colleges. The financial and the transcript portions are due for installation late in 1985. Activity on this contract is expected to continue at the current level through the spring of 1986 and then reduce to somewhat less than half of that.

For many years DISD’s major contract has been to develop and maintain a Medicaid Management Information System (MMIS) for the Department of Social Services. In recent years this contract has been more maintenance than development, but recent significant changes in federal requirements has led to an increase in MMIS activity. DISD has increased its MMIS level of effort by about 25 percent in 1984-85 and expects to continue at the current level for the foreseeable future. A major new contract with the Department of Social Services is to develop a new Title IVD (child support) information system. This system has significant staffing requirements, but not all the people required will need to be newly hired. The timetable for implementing the system is such that the people freed from the technical college system will be able to move to the IVD system without any slack time and without slowing down the IVD project. In anticipation of additional major contracts, DISD has obtained
approval to hire personnel as necessary to prevent delays between signing contracts and beginning systems development.

DISD continues to support the computing activities of a number of other State agencies and is seeking to expand its services in the areas of microcomputer and office automation systems development and consultation. The development of microcomputer systems and consultation with agencies wishing to set up microcomputer or office automation networks are seen as potentially fertile fields for future DISD projects.

DISD's growth has resulted in a shortage of office space to house the staff required to work on the various contracts. Currently occupying less than one complete floor of a section of Martin Hall, DISD staff have already completely utilized all the space available to them, even though hiring for current contracts is not yet complete. Additional space will have to be found if the contracts are to be completed on time. Negotiations for space are under way with various departments.

DISD is dependent on outside contracts for its survival. Since contracts are for a limited period, DISD's long-term prospects are always problematical. However, the number and size of current contracts are encouraging, and DISD can be said to be in excellent health.
The Office of Human Resources has been an integral part of the University’s successful efforts to fulfill the objectives of affirmative action, equal employment opportunity and the State Desegregation Plan. Many programs continue to be implemented throughout the University focusing on a wide group, ranging from high school students to faculty, and resulting in increases in black representation on campus. The number of black faculty at Clemson has increased to 24 at the same time there has been a decrease on the national level. There are five new black faculty appointments for fall 1985.

The first Distinguished Scholar-in-Residence was named during the year. This program, developed by the Office of Human Resources, is one in which an eminently qualified black in a given field receives a one-year visiting professorship. Not only does this appointment acknowledge a person who has reached the upper levels of academic achievement, but it also benefits Clemson’s growing black student body. The first Distinguished Scholar-in-Residence is Dr. Margie N. Johnson, who received an appointment in the College of Nursing.

Two additional blacks have joined the University through the Administrative Management Trainee Program. Through intensive, individualized training as full-time employees, this program has now enabled eight blacks to enter professional positions within the University. In addition to mastery of on-the-job tasks, the training included seminars, professional workshops and courses designed to enhance skills and develop potential.

In the student body, black graduate students enrolling for the first time have increased from 19 in fall 1981 to 42 in fall 1984. Through the efforts of the Admissions counselors and special programs such as the Career Workshops, black undergraduate enrollment also continues to increase. There were 488 black students in fall 1984, an increase over 433 in fall 1983.

The Summer Nursing Programs and the Summer Science and Engineering Honors Program, administered through other departments, are directed toward career awareness in black high school students. In addition to providing opportunities to individual students, these programs will result in increased black representation in professions now underrepresented.

It is important to realize that all increases signify not only immediate changes in numbers, but also changes in procedures, attitudes and values, which will continue to yield increases in the future.

The Office of Human Resources has two additional projects under way. One is a regional conference, “Vital Issues: The Future of Affirmative Action and Desegregation in Higher Education,” which will examine
issues relating to affirmative action and desegregation in higher education. The other project is the publication of a comprehensive affirmative action/equal employment manual, which will be distributed throughout the University and will serve as a guide in implementing affirmative action/equal employment opportunity in employment practices.
INSTITUTIONAL ADVANCEMENT

With record-setting levels of private support for academics, the start up of new programs and a reorganization to streamline academic fund raising, the Institutional Advancement program enjoyed a banner year in 1984-85.

Headed by Dr. J. Donald Elam, vice president for institutional advancement, this administrative area now has responsibility for three major programs which are considered crucial to a successful fund raising formula: Alumni Relations, Development and University Relations. The past year also saw the establishment of an Alumni/Development Administrative Services Unit to serve as a clearinghouse for receiving and recording all private gifts to the University.

Development Office

The objectives of Clemson's private support efforts are deliberate and broad based. They encompass growth in the unrestricted permanent endowment, expansion of all phases of general and endowment support for faculty, increased sources of student financial aid and further development of the annual Loyalty Fund program, which enhances the total academic environment.

While State appropriations are a part of the total support for the educational activities at Clemson, more than 50 percent of the total budget must come from other sources. In that context, the ultimate quality of the University rests with private support from business, industry, alumni and friends of the University.

With a reorganization of some staff responsibilities and program shifts, the Office for Development is now the umbrella for all academic fund raising. This was achieved during the past year by moving the Alumni Loyalty Fund (now Loyalty Fund) program and the annual solicitation of parents, faculty, staff and friends from the Office of Alumni Relations to the Office for Development.

More than $8.9 million was contributed from January 1984 through June 30, 1985, when Clemson's fund raising programs completed an 18-month transition during which their reporting cycle was switched from the calendar year (Jan. 1-Dec. 31) to coincide with the University's fiscal year operation (July 1-June 30). The grand total represents gifts from all support groups, including alumni. Some 12,250 donors contributed.

Because of the change to a fiscal year operation, a straight comparison of the $4.1 million of private support in 1983 with this year's total would be misleading.

But even given that qualification, the figures for the 1984-85 transition year are impressive because they reflect unprecedented support for and
interest in academic giving by Clemson alumni and friends and the private sector in general.

Alumni participated at a record level in the Loyalty Fund. Clemson's alumni-participation percentage is about 28 percent (11,275 people), more than twice the national average. Loyalty Fund gifts from alumni and friends exceeded $1 million last year.

The mission of the Development Office is to attract — to the fullest extent possible — the private support of Clemson's constituent support groups to supplement the University's tax-assisted budget, in order to maintain and enhance academic excellence at all levels. The development staff, consisting of six full-time professionals, conducts annual and capital giving programs utilizing many alumni and other volunteers.

Also a primary responsibility of the Office for Development is the coordination of all academic fund raising programs campuswide. The Campus Annual Fund Coordinating Council was established in 1984 by the Office for Development to help deans, department heads and professors cultivate and solicit private gifts for their school, college or unit. The council, which is chaired by a college dean, comprises all deans and representatives from the library, athletics, various institutes and other campus entities.

Private support from the Loyalty Fund provides needed funds for scholarships, professorships, library acquisitions and a myriad of projects and programs aimed at strengthening academic programs. Since less than 50 percent of the University's budget is provided by the State, private support as a supplement to State assistance is critically important to Clemson's mission of teaching, research and service.

As Clemson approaches its Centennial celebration in 1989, the Office for Development will conduct the University's first capital fund raising effort for construction and endowment funds. This Centennial Campaign will seek substantial gifts from alumni, friends, corporations, foundations and other groups to strengthen Clemson's endowment as a means of preparing for the University's next 100 years of service.

**Alumni Relations**

During the transition fiscal year of 1984-85, the alumni and resources development program became a part of the newly organized division of Institutional Advancement. The general philosophy of the division is reflected by an organizational structure that places University Relations, Alumni Relations and the Development Office under a single administrative officer. The alumni office has assumed the posture of a service and recognition program designed to enhance the environment for fund raising among Clemson's 44,000 living alumni.

The office continues to reinforce the fund raising efforts of the Devel-
opment Office by helping recruit and identify fund raising volunteers in the various districts.

The Clemson Clubs program has been expanded greatly. An alumni staff member has attended all club meetings scheduled in the spring and had the opportunity to address some 15,000-plus alumni. In addition, staff members or representatives of the University’s academic interests have been scheduled to speak at a number of locations both within the State and in other cities throughout the country. These programs highlight educational accomplishments of the University.

A follow-up program has been developed for those students who participate in the senior challenge. Regular reminders are sent to those alumni who, as seniors, made a commitment to the Loyalty Fund over the five years following their graduation.

The *Clemson World* has been improved in design and layout, and with valuable assistance from University Relations editors, the content has been broadened. The magazine continues to be honored at the national level, not only by the Council for Advancement and Support of Education, but most recently by the national publication, *Communications Art and Design*. Charter members of the major giving clubs — the Founders Society, Clemson Fellows and Presidents Club — were recognized in the *Clemson World*, and names of new members are published on a recognition page in each quarterly issue. Ad space has been provided to the Development Office for a message concerning annual giving or deferred giving.

The Alumni/Development Administrative Services unit has expanded its services dramatically during the past 18 months. A pledge screen has been developed; a free-form screen has been added for random information to be placed on selected individual records; more detailed daily, weekly, monthly and annual reports have been programmed; and technical updating of the system is being done on a current basis consistent with the Computer Center’s capability to provide advanced systems modifications. Working with printing contractors, type for the annual Honor Roll is now set from an EOP tape generated from the alumni database. This capability reduces time for proofreading and greatly increases the timeliness of the publication.

Constituent groups are being served to establish closer ties with the Alumni Association and the University. CAPS (physicians) has been a model for other groups to consider as they develop programs of their own — lawyers, dentists, Tiger Band, and eventually schools, colleges and units.

Annual programs for law students and medical students at MUSC and USC, who did their undergraduate work at Clemson, are being continued by the Alumni Office. Cookouts and “low-country boggs” are planned each spring for these groups to keep them in close contact with their
undergraduate alma mater. Expanding on that theme, the Alumni Association also has a hospitality room at the S. C. Medical Association.

Other student-oriented programs are improving, with new activities planned by the Student Alumni Council and the interaction we have with student government. The first Senior Picnic was a great success. The first Welcome Back Festival was held in August for all students. This is a cooperative effort that includes the Alumni Association, SAC and the Clemson Chamber of Commerce.

The Career Services Program has expanded three-fold in the last 18 months and, through close contact with the companies seeking Clemson graduates, has come to be an almost self-sustaining operation.

Recognition programs continue to get high visibility and include the master teacher, the distinguished public service and the award for outstanding research accomplishments.

University Relations

The Office of University Relations provides news and public information services, electronic and photographic services, publications and graphics services, visitor services and general public relations counsel to the University's academic and administrative divisions, including the Clemson Cooperative Extension Service and the S. C. Agricultural Experiment Station.

Department of Agricultural Communications

The Department of Agricultural Communications was formed this year to serve the communications needs of the public service agencies in the College of Agricultural Sciences. A primary goal is to serve the people of South Carolina by providing information that will help them improve their productivity and their standards of living. This has been accomplished through:

- Providing news articles, columns and features for the general media, both print and broadcast, and for specialized publications. The department also provided a special training program on agriculture for media people.
- Providing agriculture, health, nutrition, home care and other publications of value to homeowners, growers, families and young people.
- Developing exhibits for use throughout South Carolina and neighboring states.
- Working with Extension employees to develop their communications skills.

Department of News Services

The Department of News Services continued to provide the University
with a means of communication to the public through external news media, and this year assumed administrative responsibility for internal news vehicles, including “Clemson University News” and the campus newsletter.

Traditional services — generating news and feature stories about the University’s educational, public service and research programs, editing and marketing regular faculty-written columns and book reviews, coordinating coverage of campus events and speakers, handling press conferences, and acting as liaison between the University and the print and broadcast media — continued.

The news services’ ongoing relationship with S. C. Educational Television resulted in an award from the Council for the Advancement and Support of Education for the “Carolina Journal” executive producer, who was nominated by the department for regularly featuring Clemson faculty on the public affairs talk show.

Department of Electronic and Photographic Services

The Department of Electronic and Photographic Services is responsible for providing production support services in television and radio, photography and visual aids for the University’s academic and administrative programs, including the Clemson Cooperative Extension Service and the S. C. Agricultural Experiment Station.

The Electronic Services group provides TV studio production, production of video and audio tapes for teaching and other purposes, slide/tape and multi-image productions, tele-lecture equipment loans, and audio and video teleconferencing. The Photographic Services group provides color slides, black-and-white and color photographs, artwork for audiovisual presentations and cinematography. The Educational Resources group provides audio-visual equipment loans; film, multi-image, video and audio tape resources for loan to units of the University; and distribution of publications, bulletins, pamphlets and other educational material for the Cooperative Extension Service and the S. C. Agricultural Experiment Station.

Department of Publications and Graphics Services

The Department of Publications and Graphics Services continued its efforts toward improving and making more efficient the services it offers to all education and general units of the University. These services include planning, writing, designing and producing publications, presentation visuals, exhibits, stationery and forms.

The 1984-85 fiscal year was the first full year the department operated under an official publications and graphics policy, which established guidelines for use of the University’s graphic identity elements and stipulated that copy and designs for all publications intended for an
external audience be approved by the department. Partly as a result of the policy, the department had a 32% increase in workload over that of last fiscal year. Approximately 500 jobs were in production during 1984-85 compared to 340 in 1983-84.

Visitor Programs

Two new direct public-contact programs — one brand new to Clemson and the other an expansion of a time-honored activity — were implemented by another major service area of University Relations — Visitor Programs, which administers the new Universitywide Visitors Center, the Board of Visitors program and two campus historic landmark houses — Fort Hill and Hanover House.

Clemson’s traditional Board of Visitors program took on both a new philosophy and a new organization during the past year. The program includes two-year membership commitments, two campus visits annually and a membership roster which will reach 50 volunteers in mid-1985. Also, members have been assigned to five working committees: academic affairs, legislative relations, media relations, publications and research.

The University’s full-service Visitors Center, which opened June 4, 1984, celebrated a highly successful first year of rolling out the orange carpet, welcoming 12,967 visitors. The center provides a variety of services to meet the informational needs of an increasing number of campus visitors. Services include general information, guided and self-guided tours, audio-visuals and publications.
STUDENTS

The 1984-85 academic year marked the highest on-campus enrollment with 12,122 students registered for classes — 10,934 full time and 1,188 part-time. An additional 804 were in various off-campus programs bringing the total enrollment to 12,926, a record high for the University. Of the total enrollment, 2,438 were graduate students.

The College of Engineering again had the highest on-campus enrollment with 3,511 students. The College of Commerce and Industry was second with 2,510, followed in order by Sciences, Education, Liberal Arts, Agricultural Sciences, Architecture, Forest and Recreation Resources, and Nursing.

Higher education continued to become increasingly accessible as evidenced by the increased number of freshmen entering college with advanced standing. In the 1984-85 fall semester, new high school graduates entered Clemson with advanced standing by means of College Board Advanced Placement courses (323 students, 3,317 credit hours), concurrent enrollment in high school and college (119 students, 658 credit hours) and enrollment in summer school (84 students, 256 credit hours).

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 41 percent of the freshman class entering in fall 1984 ranked in the top 10 percent of their class, 67 percent in the top 20 percent and 94 percent in the top 50 percent. In 1984 the freshman class average Scholastic Achievement Test (SAT) score of 1,012 compared with an average of 897 reported by the College Board for all high school seniors. It is also the highest average among state-supported institutions in South Carolina.

Of the 7,079 new applications for admissions processed for 1984-85, 4,615 were accepted, and 2,625 actually enrolled (including freshmen and transfer students). South Carolina residents accounted for 72 percent of the 12,926 students, including those enrolled in off-campus programs. Clemson students come from all 46 South Carolina counties, 48 states, Puerto Rico, the District of Columbia, the Virgin Islands and 77 foreign countries (430 students).

Greenville County continued to have the most students enrolled on campus (1,198). Pickens County was second with 991, followed in order by Anderson, Charleston, Oconee and Spartanburg counties. Most out-of-state students came from Georgia (561), North Carolina (550) and Florida (429).

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

<table>
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<tr>
<th>Year</th>
<th>Undergraduate</th>
<th>Graduate and Others</th>
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<td>7,910</td>
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<tr>
<td>1984-85</td>
<td>10,488</td>
<td>2,438</td>
<td>12,926</td>
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</table>

The 1984-85 figures include 559 students attending off-campus institutes and 173 in the Clemson-Furman University Master of Business Administration degree program.

The on-campus enrollment of women at Clemson reached an all-time high during the 1984 fall semester. There were 5,048 of which 4,398 were undergraduates. Enrollment of undergraduate coeds increased 2 percent over last year. Women now constitute approximately 42 percent of the on-campus undergraduate enrollment.

The Clemson student body continues to be a working group receiving a significant amount of financial assistance in the form of loans, grants, scholarships and work assistance. In 1984-85 approximately 2,763 students earned an estimated $7,511,806 working for the University. This figure does not include earnings from off-campus employment. Clemson awarded 416 long-term loans totaling $473,300. The University also approved and certified 2,954 guaranteed student loans from a variety of lending institutions. Excluding donor-selected scholarships, 647 scholarships and grants valued at $623,281 were awarded. The number of students receiving Pell Grants was 1,500 with awards totaling $1,847,108. In all, an estimated 67 percent of the student body received an estimated total of $18 million in financial assistance.

Students at Clemson University enjoyed educational experiences outside the classroom through participation in student organizations. The number of organizations has increased steadily, and Clemson now recognizes more than 260 student groups. Half of these groups directly complement the academic experience by providing career-oriented fellowship, programs and trips to professional conferences. Our students enjoy com-
petition through 41 sports clubs, socialization through 38 social clubs and fellowship through 31 religious organizations. In addition, more than 40 student groups have formed to provide associations with other students interested in fine arts, media, military, government and community service.

Student Government continues to grow and add new programs for the student body. Approximately 300 people this year represented the students in the senate, the court system and the Student Traffic Review Board, as well as providing services through various committees in the executive branch. This year’s services included copy machines, typewriters, refrigerator rentals, security shuttles and free legal aid. In addition to the traditional Central Spirit Committee activities, Student Government sponsored a Spirit Blitz with balloons and card sections at the Virginia Tech game.

The TAPS yearbook, The Tiger newspaper, and WSBF radio are enjoying a resurgence of student involvement. These outlets for literary and broadcasting talents have attracted twice the number of students than in years past.

Clemson’s 11 sororities and 19 fraternities claimed total membership of more than 2,000 students. Sorority women emphasized academic excellence and maintained an average grade point ratio of 2.85, which was higher than the University’s overall female student average of 2.68. In a move toward self-governance this year, the National Pan Hellenic organizations primarily composed of minority students formed the Pan Greek Council, which parallels the Panhellenic and Interfraternity Councils.

Parking and traffic records are maintained to coincide with the academic calendar from August 15 to August 15 each year. During the period August 15, 1984, through May 15, 1985, 10,659 student parking decals were issued, and $20,420 was deposited to the Miscellaneous Income Account. The Clemson University police wrote 43,187 parking tickets. The amount of parking fines collected by the Department of Parking and Vehicle Registration and deposited to the MIA was $57,285, and $265,169 was transferred to the accounting office for collections. The Student Traffic Review Board heard appeals from 1,800 students involving 2,236 parking tickets, or about 5.5 percent of the tickets written.

Career Services, composed of Placement and Cooperative Education, had a busy year with increased participation by both students and employers.

The number of seniors registered with the Placement Office increased by 17 percent over last year to 1,334. These students conducted 7,620 interviews, which is very close to the all-time high during the 1981-82 school year. The number of job offers was about the same as last year, but there was a solid gain in salaries for most disciplines, with Clemson students in line with the College Placement Council’s national average.
Student interest and employer participation in the Cooperative Education Program remained strong throughout the year resulting in an increase in program size. Total student enrollment rose from 403 in July 1984 to 527 in July 1985. The number of new students joining the program increased from 176 in 1983-84 to 257 in 1984-85. Twenty-five employers initiated cooperative education agreements with Clemson University during the past year. Student earnings rose from $2.1 million in the 83-84 academic year to $3.1 million in the 84-85 academic year.

The Clemson University Union works through its 11 student program committees and 300 student volunteers to provide social, cultural and recreational programs designed to serve the needs of Clemson University students, faculty and staff. The Union provided more than 1,000 different programs during 1984-85. Program highlights included the appearance of Bill Cosby for Homecoming; a very successful Performing Artist Series with 600 season ticket holders; and a very successful concert year highlighted by Kenny Rogers and Dolly Parton and the Hall and Oates Band.

### Number and Percent of Black Students

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

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### Number in Freshman Class
(New Students)

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<td>1978</td>
<td>2,020</td>
</tr>
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<td>1979</td>
<td>1,998</td>
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<tr>
<td>1980</td>
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</tr>
<tr>
<td>1981</td>
<td>2,284</td>
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<tr>
<td>1982</td>
<td>2,321</td>
</tr>
<tr>
<td>1983</td>
<td>2,122</td>
</tr>
<tr>
<td>1984</td>
<td>2,188</td>
</tr>
<tr>
<td>Year</td>
<td>Rate</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>1972</td>
<td>83%</td>
</tr>
<tr>
<td>1973</td>
<td>83%</td>
</tr>
<tr>
<td>1974</td>
<td>84%</td>
</tr>
<tr>
<td>1975</td>
<td>77%</td>
</tr>
<tr>
<td>1976</td>
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<td>1977</td>
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<td>69%</td>
</tr>
<tr>
<td>1979</td>
<td>60%</td>
</tr>
<tr>
<td>1980</td>
<td>59%</td>
</tr>
<tr>
<td>1981</td>
<td>59%</td>
</tr>
<tr>
<td>1982</td>
<td>52%</td>
</tr>
<tr>
<td>1983</td>
<td>63%</td>
</tr>
<tr>
<td>1984</td>
<td>65%</td>
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<table>
<thead>
<tr>
<th>Year</th>
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<tbody>
<tr>
<td>1971</td>
<td>84%</td>
</tr>
<tr>
<td>1972</td>
<td>82%</td>
</tr>
<tr>
<td>1973</td>
<td>83%</td>
</tr>
<tr>
<td>1974</td>
<td>83%</td>
</tr>
<tr>
<td>1975</td>
<td>82%</td>
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<tr>
<td>1976</td>
<td>84%</td>
</tr>
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<td>1977</td>
<td>84%</td>
</tr>
<tr>
<td>1978</td>
<td>87%</td>
</tr>
<tr>
<td>1979</td>
<td>87%</td>
</tr>
<tr>
<td>1980</td>
<td>87%</td>
</tr>
<tr>
<td>1981</td>
<td>89%</td>
</tr>
<tr>
<td>1982</td>
<td>87%</td>
</tr>
<tr>
<td>1983</td>
<td>87%</td>
</tr>
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</table>
### Number of On-Campus Students in Summer School

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1972</td>
<td>5,232</td>
</tr>
<tr>
<td>1973</td>
<td>6,267</td>
</tr>
<tr>
<td>1974</td>
<td>5,997</td>
</tr>
<tr>
<td>1975</td>
<td>6,275</td>
</tr>
<tr>
<td>1976</td>
<td>6,100</td>
</tr>
<tr>
<td>1977</td>
<td>6,301</td>
</tr>
<tr>
<td>1978</td>
<td>6,393</td>
</tr>
<tr>
<td>1979</td>
<td>6,708</td>
</tr>
<tr>
<td>1980</td>
<td>6,858</td>
</tr>
<tr>
<td>1981</td>
<td>6,897</td>
</tr>
<tr>
<td>1982</td>
<td>7,149</td>
</tr>
<tr>
<td>1983</td>
<td>7,442</td>
</tr>
<tr>
<td>1984</td>
<td>7,418</td>
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### Number of Dorm Beds and Percent Being Used

<table>
<thead>
<tr>
<th>Year</th>
<th>Beds</th>
<th>Percent</th>
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<tbody>
<tr>
<td>1972</td>
<td>5,174</td>
<td>100</td>
</tr>
<tr>
<td>1973</td>
<td>5,330</td>
<td>102</td>
</tr>
<tr>
<td>1974</td>
<td>5,592*</td>
<td>101</td>
</tr>
<tr>
<td>1975</td>
<td>5,616*</td>
<td>103</td>
</tr>
<tr>
<td>1976</td>
<td>5,625*</td>
<td>103</td>
</tr>
<tr>
<td>1977</td>
<td>5,662*</td>
<td>103</td>
</tr>
<tr>
<td>1978</td>
<td>5,683*</td>
<td>104</td>
</tr>
<tr>
<td>1979</td>
<td>5,726*</td>
<td>106</td>
</tr>
<tr>
<td>1980</td>
<td>6,317*</td>
<td>112</td>
</tr>
<tr>
<td>1981</td>
<td>6,864*</td>
<td>100</td>
</tr>
<tr>
<td>1982</td>
<td>7,149*</td>
<td>105</td>
</tr>
<tr>
<td>1983</td>
<td>7,113*</td>
<td>104</td>
</tr>
<tr>
<td>1984</td>
<td>6,976*</td>
<td>102</td>
</tr>
</tbody>
</table>

* Includes beds in the Clemson House:
  - 1974 — 252
  - 1975 — 262
  - 1976 — 271
  - 1977 — 308
  - 1978 — 317
  - 1979 — 324
  - 1980 — 329
  - 1981 — 330
  - 1982 — 328
  - 1983 — 331
  - 1984 — 331
<table>
<thead>
<tr>
<th>Sport</th>
<th>Home</th>
<th>Away</th>
<th>Neut.</th>
<th>ACC</th>
<th>Overall</th>
<th>ACC Reg. Finish</th>
<th>ACC Trn. Finish</th>
<th>National Ranking</th>
<th>All-ACC American Ranking</th>
<th>All-ACC American Players</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men's Soccer</td>
<td>16-1</td>
<td>5-1</td>
<td>1-2</td>
<td>4-2</td>
<td>22-4</td>
<td>.846</td>
<td>2nd</td>
<td>NA</td>
<td>First</td>
<td>2</td>
</tr>
<tr>
<td>Women's Swimming</td>
<td>3-1</td>
<td>5-1</td>
<td></td>
<td>3-1</td>
<td>8-2</td>
<td>.800</td>
<td>1st (T)</td>
<td>3rd</td>
<td>19th</td>
<td>8</td>
</tr>
<tr>
<td>Wrestling</td>
<td>8-2</td>
<td>5-2</td>
<td>1-1</td>
<td>4-1</td>
<td>14-5</td>
<td>.737</td>
<td>2nd</td>
<td>3rd</td>
<td>46th</td>
<td>2</td>
</tr>
<tr>
<td>Men's Swimming</td>
<td>3-2</td>
<td>5-1</td>
<td>1-1</td>
<td>4-1</td>
<td>8-3</td>
<td>.727</td>
<td>2nd</td>
<td>2nd</td>
<td>26th</td>
<td>8</td>
</tr>
<tr>
<td>Women's Basketball</td>
<td>9-4</td>
<td>6-3</td>
<td>3-2</td>
<td>8-6</td>
<td>18-9</td>
<td>.667</td>
<td>4th</td>
<td>5th (T)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Men's Tennis</td>
<td>10-3</td>
<td>8-4</td>
<td>6-5</td>
<td>7-0</td>
<td>24-12</td>
<td>.667</td>
<td>1st</td>
<td>1st</td>
<td>8th</td>
<td>6</td>
</tr>
<tr>
<td>Women's Swimming</td>
<td>3-2</td>
<td>5-2</td>
<td>4-1</td>
<td>8-3</td>
<td>17-14</td>
<td>.592</td>
<td>6th</td>
<td>6th</td>
<td>10th</td>
<td>5</td>
</tr>
<tr>
<td>Football</td>
<td>5-1</td>
<td>2-2</td>
<td>0-1</td>
<td>7-4</td>
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<td>NA</td>
<td>NA</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Men's Basketball</td>
<td>12-4</td>
<td>3-8</td>
<td>1-1</td>
<td>5-9</td>
<td>16-13</td>
<td>.552</td>
<td>6th</td>
<td>5th (T)</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Baseball</td>
<td>16-9</td>
<td>16-19-1</td>
<td>4-2</td>
<td>9-4</td>
<td>36-30-1</td>
<td>.537</td>
<td>1st (T)</td>
<td>2nd</td>
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<td>0</td>
</tr>
<tr>
<td>Men's Outdoor Track</td>
<td>1-0</td>
<td>0-1</td>
<td></td>
<td>1-1</td>
<td>1-1</td>
<td>NA</td>
<td>2nd</td>
<td>43rd</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Volleyball</td>
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<td>1-11</td>
<td>2-11</td>
<td>2-5</td>
<td>8-28</td>
<td>.222</td>
<td>6th</td>
<td>5th (T)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Golf</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
<td>6th</td>
<td>27th</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Men's Cross Country</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
<td>2nd</td>
<td>13th</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Men's Indoor Track</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>1</td>
</tr>
<tr>
<td>Women's Indoor Track</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
<td>NA</td>
<td>12th</td>
<td>NA</td>
<td>2</td>
</tr>
<tr>
<td>Women's Cross Country</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
<td>2nd</td>
<td>5th</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Women's Outdoor Track</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
<td>6th</td>
<td>35th</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Men's Totals</td>
<td>71-22</td>
<td>44-38-1</td>
<td>13-12</td>
<td>38-20</td>
<td>128-72-1</td>
<td>.639</td>
<td>21st</td>
<td>1st</td>
<td>5 top 30</td>
<td>41</td>
</tr>
<tr>
<td>Women's Totals</td>
<td>28-13</td>
<td>17-17</td>
<td>13-22</td>
<td>20-12</td>
<td>58-52</td>
<td>.527</td>
<td>1st</td>
<td>1st</td>
<td>4 top 30</td>
<td>19</td>
</tr>
<tr>
<td>OVERALL TOTALS</td>
<td>99-35</td>
<td>61-55-1</td>
<td>26-34</td>
<td>58-32</td>
<td>186-124-1</td>
<td>.600</td>
<td>31st</td>
<td>31st</td>
<td>9 top 30</td>
<td>60</td>
</tr>
</tbody>
</table>

1984-85 Clemson Athletics Review

ACCTm = American

National PCT = National Percentage

All-ACC PCT = All-ACC Percentage
### Fall Semester 1984 Enrollment by Colleges, and Degrees Awarded
December 1983-August 1984

<table>
<thead>
<tr>
<th>College</th>
<th>Fall Semester</th>
<th>Associate</th>
<th>Bachelor's</th>
<th>Master's</th>
<th>Specialist</th>
<th>Doctorates</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Sciences</td>
<td>754</td>
<td>0</td>
<td>122</td>
<td>70</td>
<td>0</td>
<td>14</td>
<td>206</td>
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<td>Architecture</td>
<td>506</td>
<td>0</td>
<td>83</td>
<td>78</td>
<td>0</td>
<td>0</td>
<td>131</td>
</tr>
<tr>
<td>Commerce &amp; Industry</td>
<td>2,715</td>
<td>0</td>
<td>536</td>
<td>71</td>
<td>0</td>
<td>5</td>
<td>612</td>
</tr>
<tr>
<td>Education</td>
<td>1,830</td>
<td>0</td>
<td>186</td>
<td>150</td>
<td>11</td>
<td>0</td>
<td>347</td>
</tr>
<tr>
<td>Engineering</td>
<td>3,527</td>
<td>0</td>
<td>500</td>
<td>96</td>
<td>0</td>
<td>11</td>
<td>607</td>
</tr>
<tr>
<td>Forest &amp; Rec. Resources</td>
<td>428</td>
<td>0</td>
<td>74</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>89</td>
</tr>
<tr>
<td>Liberal Arts</td>
<td>883</td>
<td>0</td>
<td>163</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>172</td>
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<tr>
<td>Nursing</td>
<td>426</td>
<td>0</td>
<td>55</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>64</td>
</tr>
<tr>
<td>Sciences</td>
<td>1,707</td>
<td>0</td>
<td>153</td>
<td>51</td>
<td>0</td>
<td>14</td>
<td>218</td>
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<tr>
<td>Non-Degree</td>
<td>150</td>
<td>...</td>
<td>...</td>
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<td>...</td>
<td>...</td>
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<tr>
<td><strong>TOTALS</strong></td>
<td><strong>12,926</strong></td>
<td><strong>0</strong></td>
<td><strong>1,872</strong></td>
<td><strong>519</strong></td>
<td><strong>11</strong></td>
<td><strong>44</strong></td>
<td><strong>2,446</strong></td>
</tr>
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</table>

Degrees awarded since 1896 (through August 1984) total 54,372 of which 426 have been associate degrees; 43,880 bachelor’s degrees; 9,207 master’s degrees; 122 education specialist degrees; and 737 doctorates. Includes 375 Clemson-Furman MBA degrees awarded May 1972-August 1984.
## OPERATING FUNDS

**FOR THE YEAR ENDED JUNE 30, 1985**

### Revenues

<table>
<thead>
<tr>
<th>Source</th>
<th>Unrestricted</th>
<th>Restricted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Fees</td>
<td>$ 25,761,779</td>
<td>-0-</td>
<td>$ 25,761,779</td>
</tr>
<tr>
<td>Federal Appropriations</td>
<td>9,298,311</td>
<td>-0-</td>
<td>9,298,311</td>
</tr>
<tr>
<td>State Appropriations</td>
<td>84,633,774</td>
<td>-0-</td>
<td>84,633,774</td>
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<tr>
<td>Local Appropriations</td>
<td>2,401</td>
<td>-0-</td>
<td>2,401</td>
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<tr>
<td>Federal Grants and Contracts</td>
<td>820,327</td>
<td>7,975,076</td>
<td>8,795,403</td>
</tr>
<tr>
<td>State Grants and Contracts</td>
<td>71,996</td>
<td>1,213,924</td>
<td>1,285,920</td>
</tr>
<tr>
<td>Local Grants and Contracts</td>
<td>-0-</td>
<td>19,708</td>
<td>19,708</td>
</tr>
<tr>
<td>Private Gifts, Grants and Contracts</td>
<td>614,798</td>
<td>7,660,188</td>
<td>8,274,986</td>
</tr>
<tr>
<td>Endowment Income</td>
<td>9,266</td>
<td>277,559</td>
<td>286,825</td>
</tr>
<tr>
<td>Sales and Services of Educational Departments</td>
<td>1,462,123</td>
<td>-0-</td>
<td>1,462,123</td>
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<tr>
<td>Sales and Services of Auxiliary Enterprises</td>
<td>31,575,812</td>
<td>-0-</td>
<td>31,575,812</td>
</tr>
<tr>
<td>Other Sources</td>
<td>5,156,718</td>
<td>513,683</td>
<td>5,670,401</td>
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<tr>
<td><strong>TOTAL REVENUES</strong></td>
<td><strong>$159,407,245</strong></td>
<td><strong>$17,660,138</strong></td>
<td><strong>$177,067,383</strong></td>
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### Expenditures and Mandatory Transfers

#### Educational and General

<table>
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<th>Category</th>
<th>Unrestricted</th>
<th>Restricted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction</td>
<td>$ 47,355,844</td>
<td>$ 1,508,733</td>
<td>$ 48,864,577</td>
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<tr>
<td>Research</td>
<td>5,830,782</td>
<td>5,210,759</td>
<td>11,041,541</td>
</tr>
<tr>
<td>Research - Agricultural Experiment Station</td>
<td>14,657,340</td>
<td>2,049,563</td>
<td>16,706,903</td>
</tr>
<tr>
<td>Extension and Public Service</td>
<td>1,338,933</td>
<td>1,636,297</td>
<td>2,975,230</td>
</tr>
<tr>
<td>Extension and Public Service — Cooperative</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural Extension Service</td>
<td>20,923,354</td>
<td>664,884</td>
<td>21,588,238</td>
</tr>
<tr>
<td>Extension and Public Service — Regulatory Service</td>
<td>3,579,968</td>
<td>912,717</td>
<td>4,492,685</td>
</tr>
<tr>
<td>Academic Support</td>
<td>10,142,931</td>
<td>323,276</td>
<td>10,466,207</td>
</tr>
<tr>
<td>Student Services</td>
<td>4,371,955</td>
<td>158,501</td>
<td>4,530,456</td>
</tr>
<tr>
<td>Institutional Support</td>
<td>11,469,127</td>
<td>263,314</td>
<td>11,732,441</td>
</tr>
<tr>
<td>Operation and Maintenance of Plant</td>
<td>10,133,459</td>
<td>-0-</td>
<td>10,133,459</td>
</tr>
<tr>
<td>Scholarships and Fellowships</td>
<td>45,200</td>
<td>4,866,444</td>
<td>4,911,644</td>
</tr>
<tr>
<td><strong>Mandatory Transfers</strong></td>
<td>218,893</td>
<td>-0-</td>
<td>218,893</td>
</tr>
<tr>
<td><strong>Total Educational and General</strong></td>
<td>$130,067,786</td>
<td>$17,639,488</td>
<td>$147,707,274</td>
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</table>

#### Auxiliary Enterprises

<table>
<thead>
<tr>
<th>Category</th>
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<th>Restricted</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auxiliary Enterprises Expenditures</td>
<td>$ 28,173,343</td>
<td>$ 20,650</td>
<td>$ 28,192,993</td>
</tr>
<tr>
<td>Mandatory Transfers</td>
<td>2,490,000</td>
<td>-0-</td>
<td>2,490,000</td>
</tr>
<tr>
<td><strong>Total Auxiliary Enterprises</strong></td>
<td>$ 30,662,343</td>
<td>$ 20,650</td>
<td>$ 30,682,993</td>
</tr>
</tbody>
</table>

**TOTAL EXPENDITURES AND MANDATORY TRANSFERS** $160,730,129 $17,660,138 $178,390,267

**OTHER TRANSFERS AND ADDITIONS/(DEDUCTIONS)** $ 147,997 $ 943,643 $ 1,091,640

**NET INCREASE/(DECREASE) IN FUND BALANCE** ($ 1,174,887) $ 943,643 ($ 231,244)
The College of Agricultural Sciences administers statewide public service programs in addition to its programs for resident instruction. Among its public service functions are administration and coordination of the varied activities and services of the South Carolina Agricultural Experiment Station, the Cooperative Extension Service, the Division of Regulatory and Public Service Programs, and the Livestock-Poultry Health Department. Reports of these divisions follow.

SOUTH CAROLINA AGRICULTURAL EXPERIMENT STATION

W. Cecil Godley, Director

The South Carolina Agricultural Experiment Station at Clemson conducts the State's only State-funded agricultural research program. Scientists in 11 departments of the College of Agricultural Sciences provide expertise for this program, while home economics research is conducted at Winthrop College by the faculty in the School of Consumer Science and Allied Professions.

Facilities at Clemson and four branch stations, renamed research and education centers in 1985, are located across the State, providing indoor and outdoor laboratories for scientists in agricultural economics, agricultural engineering, aquaculture, fisheries and wildlife, agronomy, animal science, dairy science, entomology, food science, horticulture, plant pathology and poultry science.

The branch centers are Edisto at Blackville, Sandhill at Pontiac, Pee Dee near Florence and Coastal near Charleston. In addition, Simpson Station is located at Pendleton. A new $4 million Pee Dee Center was dedicated in July of 1985.

At Experiment Station centers, researchers conduct studies relating to growers and crops in their respective geographic areas under constraints of soils and climates.

Established by Congressional Act in 1886, the Experiment Station is state controlled and gets annual operational funding from both the South Carolina General Assembly and Congress.

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

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

**Highlights and Accomplishments**

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

**Agricultural Economics and Rural Sociology**

A commitment to helping rural South Carolinians adapt to changes in technical, economic and social conditions underlies the research program of the Department of Agricultural Economics and Rural Sociology.

During 1984-85 researchers began to evaluate vegetables and horticultural crops as alternative crops with respect to their economic and biological potential. This cooperative effort among horticultural and agricultural economics departments in South Carolina, North Carolina and Georgia is spearheaded by Clemson. A vegetable market structure survey has been developed and is being conducted in the three states by this department. This information will be most helpful in determining whether or not there are economically viable markets for these commodities.

Conservation of land and water continues to be a major concern in South Carolina. Costs and benefits associated with different conservation practices and tillage systems will be estimated as well as the point at which the soil loss makes it unprofitable to farm the land. Water use and the demand for it in the year 2000 is being estimated for the State.

Estimates of local government fiscal capacity were made to help State agencies decide where to distribute community development block grants for small cities. Community water systems and water authorities, districts and companies were surveyed, and their income statements and balance sheets were analyzed to determine their financial condition. Special attention was given to their capacity to meet future water demands for household, industrial and irrigation needs.

Research in the market structure for agricultural land in South Carolina revealed that approximately 61 percent of the farm land transfers in the State was by private treaty. Transfers through real estate firms accounted for 21 percent. Foreign investors presently own approximately 500,000 acres of South Carolina agricultural land. It has been shown that foreign investors paid less per acre for their purchases than did domestic buyers.

Research in the tobacco policy area has been focused on estimating the value of tobacco allotments. Prior to passage of the No Net Cost Tobacco Act, allotments were attached to farms. For the period 1974-1982, the
nominal value of tobacco quota varied from $1.92 per pound to $6.19 per pound. Research now is focused on the effect of the No Net Cost Act.

With increasing interest in aquaculture in the State, a research effort was initiated for two species, catfish and crawfish. Enterprise budgets and cash flow analysis for these two species are being prepared. The current production and marketing practices of South Carolina catfish and crawfish producers and processors are being investigated, as well as the State’s economical potential for developing an aquaculture industry.

Agricultural economists at Clemson participated in a survey of farmers in 17 states to get their preferences for upcoming farm legislation. The views of South Carolina farmers were published and reported to policy makers involved in the legislative process.

Marketing economists studied the economic efficiency and management of dairy farms, pointing out the important steps managers might take to ensure their farm’s survival. Computer programs and analyses provided information to producers regarding good management practices and performance measures that should be monitored.

Criteria relating to the purchase price of genetically superior beef bulls were illustrated. Several alternative scenarios pointed out the impact that determinants such as amount of herd improvement, tax rate and type of financing would have on what producers pay for a bull.

Researchers are participating in a regional project designed to describe and recommend improvements for the delivery of health and social services in rural counties. To become familiar with the delivery of health and social services in the three counties, surveys are being conducted on a one-to-one basis at five different levels. These levels include the directors, supervisors and non-supervisors of health and social services, so-called knowledge of health and social services, and clients of these services. Through surveying, a better understanding of health and social services delivery in rural counties should be obtained, and recommendations for improvement can then be made.

Agricultural Engineering

Agricultural engineers have been involved in a wide range of research efforts aimed at increasing food and fiber production while using less fossil energy and maintaining a high quality environment.

Research has continued on the development and implementation of ground color charts for maturity assessment of fresh market peaches. Grader performance is being evaluated over a range of cultivars to determine the feasibility and resolution of maturity scoring. Electronic circuitry has been developed to non-destructively sense flesh firmness by processing of impact force signals. Mathematical models are being used to evaluate the firmness sorting capability for variations in the other peach parameters.
Computer vision systems have been developed to identify and locate fruit on a tree as a precursor to robotic harvesting. Research has begun on the development of sensors for controlled application of chemicals by orchard air-blast sprayers.

On-farm delivery of decision-making aids involving simulation of cotton crop growth and yield in a personal computer has resulted in reduced costs of production. Decisions on irrigation, fertilization, defoliation, cultivation and insect control are being made.

A computerized data acquisition system was designed for use in erosion research. Development of a rainfall simulator to be used in expanded surface and ground water quality research was initiated.

Computer simulation of a caged broiler production facility using solar energy and methane gas produced from the broiler waste was nearly completed. A prototype facility is under construction using a ventilation system based upon model studies from the previous year. Allied with this project, a mathematical relationship was developed to aid the design process for heat recovery systems and to determine their effect upon the ventilation schedule of an animal facility. The relationship allows direct determination of the ventilation schedule when using a counterflow heat exchanger for heat recovery.

Tractor power and fuel requirements for different tillage systems have been measured. Soybean yield returns for the various tillage inputs have been measured for five Coastal Plains soils.

Effects of high moisture content and the presence of trash and splits in stored soybeans have been shown to reduce germination count. The use of a trash separator to remove the major part of the trash, or at least the use of a spreader in the bin to evenly distribute trash and fines, is recommended to help reduce hot spots caused by trash. Aeration from time to time during periods of cool, dry weather is also recommended to keep the soybeans at a uniform temperature to prevent the development of wet spots.

In a survey of randomly selected dairy farms throughout South Carolina, about 20 percent were found to have one or more places within the milking area which can be touched by cows and which have an AC voltage potential of .5 volts or more. Many cows are sufficiently sensitive to this level of voltage to make it a problem. Poor wiring conditions caused by old age and/or lack of meeting National Electric Code installation standards were judged to be the major cause of these voltages.

The movement of a pesticide (aldicarb) is being monitored at the Edisto Research and Education Center in a fallow plot and a soybean plot. Samples of soil, soil water and groundwater are collected at various intervals to detect the movement.

The second year of applying swine lagoon effluent onto hardwood
seedlings is under way. Application rates are 0, 20, 47, 74 and 144 centimeters per year during the growing season.

Laboratory studies have continued with the use of silages (corn, wheat and oats) as substrates for anaerobic digestion. Effluents from the digesters have been successfully used as fertilizer sources for growth studies on corn seedlings.

Laboratory screening of 100 South Carolina waste and byproducts as potential feedstocks for ethanol production has identified a number of possible products. Two of these would produce even better yields of ethanol than corn. A commercial ethanol plant is being constructed in South Carolina to use these raw materials.

An aquacultural research facility, with 32 new ponds for catfish and crawfish research is being constructed at Clemson. Current research focuses on the areas of fingerling production, cage design and feeding systems for catfish.

A U. S. Patent was granted on Feb. 5, 1985, entitled “Seeding Implement.” This device is being manufactured as a part of the Clemson Pasture Seeder/Renovator by Valkenburg Equipment Corp. of Greenwood. Twenty-four units were sold for the fall of 1984 and spring 1985 clover planting season.

Development of a mechanical harvester prototype for dwarf fruit trees was continued. Unique harvesting and conveying mechanisms were constructed. The results appear promising for further development and evaluation.

Agronomy and Soils

The Agronomy and Soils Department conducts research in field crops management and production, including development of improved varieties of soybeans, tobacco, cotton, forages, wheat, oats and barley and basic plant genetics. A second major area of research is in soil science, including the chemistry, physics, biology and mineralogy of soils.

Three areas of particular interest and importance in the past year have been in the improvement of fescue pastures, in research on Rhizobium, the nitrogen fixing organism, and in soil water movement.

Tall fescue is one of the most productive forage grasses adapted to the upper Piedmont of South Carolina. Recently producers and scientists have observed that livestock gains have not been as large as would be expected when fescue has been the primary forage. It appears that the fescue in these pastures is infected with a fungus that produces a substance toxic to livestock. A new research program is seeking cost effective ways to eradicate the infected fescue plants and replace them with fungus-free fescue. The potential for increased production of beef and livestock products is great.

Soil nitrogen is one of the key nutrients regulating crop yields, and it
also accounts for one of the major costs of production. When farmers grow legumes — plants that are able to convert nitrogen gas in the air in forms the plant can use — they save on fertilizer costs since nitrogen fertilizer does not need to be applied to these crops. Legumes are able to use atmospheric nitrogen because of a relationship that develops between Rhizobium microorganisms and the roots of the legume plant through a process called "fixation." Often these organisms are found naturally in the soil, but the species are usually not the most efficient in nitrogen fixation.

Just as crop varieties can be selected for high yields, Rhizobium species can be selected for high nitrogen-fixing ability. Soil microbiologists are working at Clemson to combine the highly competitive nature of common Rhizobium strains with the high nitrogen-fixing ability of selected strains through the use of genetic engineering techniques.

Water movement in soils is a critical issue to achievement of the production potentials of agricultural soils as well as to understand the fate of a host of chemical substances that end up in the soil, either as a result of being used in agricultural productions or being discarded somewhere over the landscape. New work in the Agronomy and Soils Department will reveal whether our knowledge of soil structure, gained through soil surveys and classification, can be used to predict how water moves around soil aggregates and eventually finds its way through the complex soil structural units into groundwater, or moves into soil aggregates where it can be stored for future crop production requirements.

Animal Science

Failure of cows to return to heat and subsequently become pregnant early in the breeding season is a major problem in the beef cattle industry. Length of time required for the suckled cow to show first heat after calving ranges from 46 to 168 days. Nutrition during lactation has a pronounced effect on the body condition of the beef cow and subsequent ability to show heat and conceive. Cows that calve in a low body condition have a higher heat response and improved pregnancy rates after 60 days of breeding if they maintain or gain weight from calving to breeding. Cows that calve in optimum body condition show heat 12 days earlier and become pregnant six days earlier than cows that calve in a low body condition. Harmful effects of low body condition at calving may be overcome by offering a high feed intake two weeks prior to and through the breeding season.

Lysine, an important amino acid of proteins, is typically low in most grains; therefore, protecting supplements are necessary in formulating swine diets to offset a lysine deficiency. Several years ago, high-lysine corn varieties created a lot of interest but never gained widespread acceptance by corn growers or swine producers. The potential for feed cost savings is great if protein supplements could be replaced by cheaper,
naturally occurring lysine sources. Strains of huskless oats were found to contain less fiber, more digestible energy, higher protein levels and significantly more lysine than conventional oats. When supplemented with lysine, oat diets produced performance similar to a corn-soybean meal diet, thus indicating that the nutrients in oats were highly available and that lysine was the most limiting amino acid in the grain.

Baby pigs prefer temperatures above 90 degrees Fahrenheit during the first week of life. On the other hand, sows are uncomfortable with temperatures over 80 degrees F; therefore, it is difficult to design a farrowing house that will provide a comfortable environment for both the sow and her pigs. Most farrowing houses are maintained at approximately 70 degrees F, and the pigs are provided supplemental heat via 250-watt heat lamps, a costly energy source. Plywood boxes of approximately three square feet, each containing one 15-watt bulb, were placed in farrowing crates and compared to the conventional heat lamp system. The management system affected neither pig survival nor weaning weight, but total energy cost was reduced with the box system. Electrical costs of boxes and heat lamps were estimated at 34 cents and $4.23 per farrowing, respectively. Other management techniques can reduce the energy costs of operating the farrowing unit.

Crossbreeding offers the opportunity to combine two or more breeds to produce superior offspring that contain important production characteristics of their parents. Traditionally, crossbreeding has been limited to combining the British breeds, but more recently it has expanded to include the larger, exotic beef breeds. Using the larger, exotic breeds in a crossbreeding program has demonstrated that more pounds of calf can be produced per dam. However, one must pay attention to the nutritional program if the animals are allowed to express their genetic potential. Offspring of Hereford X Angus dams performed better when allowed to graze legume-grass pastures than only grass pastures. Pregnancy rates of all breed combinations were improved with a high level of nutrition.

Aquaculture, Fisheries and Wildlife

In cooperation with the Agricultural Engineering Department, the Department of Aquaculture, Fisheries and Wildlife constructed 32 research ponds in the Clemson Bottoms. Some of the research being conducted in these ponds includes the use of enclosures to selectively feed catfish fingerlings that are stocked with sub-adults. Enclosures are being evaluated to determine if catfish can be produced more uniform in size by relieving the effects of competition.

The aquatic herbicide dichlobenil is being evaluated in catfish fry ponds. This herbicide is a pre-emergent used to prevent aquatic plants from growing in shallow brood ponds.

Thermal tolerance of larval stages of three stocks of large-mouth bass was studied. Florida large-mouth bass did not differ from stocks repre-
senting large-mouth bass at the Savannah River Plant, eliminating them as a candidate for thermally stressed environments such as cooling lakes.

Radio transmitters were developed to test the feasibility of monitoring bluebird movement and behavior by means of radio-telemetry. Radio transmitters weighing 2.35 to 2.50 grams were attached to the backs of three captive and eight free-ranging bluebirds by means of harnesses made of 7.7 kilogram-test monofilament fishing line. Birds were monitored intensively for 30 days or until transmitter failure. All except one bird were able to carry the transmitter without noticeable impairment in their activities, including the completion of nesting. Therefore, these data indicate that transmitters weighing up to seven to nine percent of the bird’s weight can be used to obtain reliable data on bluebirds.

**Dairy Science**

Dairy scientists are investigating a wide variety of subjects important for both production and processing. Lactational response to the addition of the hydroxy acid of methionine is one such research area. Forty Holstein cows, fed ad libitum, were allowed intakes of 0, 10, 20, 30 or 40 grams of methionine per 20 kilograms total dry matter ration. Although no significant change in yield or composition occurred, percentage fat and four percent FCM tended to increase with increasing levels of methionine. Changes in rumen fluid, sampled on the 12th week, showed an increase in acetate: propionate ratio and number of protozoa with increasing methionine concentration. Total plasma lipids, sampled at 8 and 12 weeks, showed a linear increase with increased methionine.

The effects of gossypol acetic acid on sperm and testicular tissue of rabbits was another research area. Twenty male rabbits were either administered tritium labelled gossypol, purpald (a fluorescent compound), or served as a control. Testicular tissue showed no morphological differences. Fluorescent appeared mostly in interstitial areas, capillaries, and basement membrane of the seminiferous tubule. Autoradiography of testicular sections showed gossypol attachment to primary spermatocytes, much less attachment to secondary spermatocytes and spermatids, and hardly any attachment to the spermatogonia. This may account for the reversible contraceptive effect of gossypol on males.

Protein solubility and digestibility of four azo-silages were determined via a modified colorimetric method. The colored azo-silages, determined via a modified colorimetric method, were produced by addition of diazonium salt to corn, sorghum, wheat and rye. Digestion and effects of dietary adaption were determined by incubating the azo-silage for 1, 3, 9 and 18 hours in microbe-free rumen fluid supernatant from either an animal on a basal diet or from animals adapted to one of the silages. Total digestion and solubility were then determined spectrophotometrically by release of azo-groups after incubations.
The effects of aflatoxin M1 at physiologic levels on newborn dairy calves were also investigated. Calves were fed milk containing three levels of AFMI (0, .5, 1 and 2 mg/kg milk). No major adverse reactions were noted, but some trends were found in increased organ weights when expressed as a percent of metabolic body size. Investigations of immune response to aflatoxin are continuing.

Entomology

A biological control program to help poultry producers with a big headache — the house fly — is now closer to reality as a result of Entomology Department research.

The black dump fly *Ophyra aenescens* has been successfully colonized on five poultry farms in 1985. When the dump fly is the predominant species in poultry waste, house fly breeding is suppressed or eliminated. The dump fly is not migratory and has not constituted a nuisance itself. One poultry farm, in its third year with this fly, has had no complaints, and expenditures for fly control over this period have been less than $500. Work continues to determine the sustainability of the dump fly at these farms and to colonize the insect at other poultry farms.

Imported fire ant research in 1984-85 centered around developing control procedures, determining economic significance (good and bad) and basic biology studies. Progress has been made in all three areas; however, the most significant progress was made in determining the underground foraging network. This effort revealed that some colonies, both active and some seemingly abandoned colonies, are directly connected via underground tunnels. It is yet to be determined if the connected colonies are one colony with satellite mounds or independent colonies. Basic information generated by this research will ultimately be used to develop management strategies for controlling the imported fire ant.

Ambrosia beetles were first positively identified as attacking peach trees in 1982. Ambrosia beetles construct galleries in the heartwood of host trees. There the young are reared. Both the adults and young feed on specific “ambrosia” fungi that are cultivated on the gallery walls and carried to new host trees by the adult beetles. Some of these fungi may kill the trees.

Intensive trapping and survey studies have been conducted since 1982 in peach orchards located in 16 counties. Six species, *Xyleborinus, saxesenii, Xylosandrus, crassiusculus, Ambrostomus rubricollis, A. tachygraphus, Xyleborus, dispar* and *Monarthrum fasciatum*, have been recovered from infested peach wood and from traps. Two of the ambrosia beetles, *X. crassiusculus* and *A. rubricollis*, are fairly recent introductions to the United States. Both are natives of southern Asia. These two species will attack apparently healthy peach trees. The other species attack trees
that are under stress. Stress factors include high ring nematode numbers, cold injury, low soil pH and poor soil drainage.

Food Science

Development and utilization of new technologies to improve food processing operations in South Carolina were targeted for particular attention by the Food Science Department.

Such technologies included single-pass, metallic membrane ultrafiltration, which can produce clarified and “cold pasteurized” juice by passing an enzyme-treated fruit puree through the ultrafiltration system in a single pass. The system consists of porous sintered stainless steel tubes with a metallic oxide membrane deposited within the porous structure of the tubes. This design permits the use of very high pressures, allowing passage of high solids materials. The process greatly simplifies fruit juice production by eliminating fruit presses, pressing aids, conventional filtration, filtration aids and heat pasteurization. Natural flavors are preserved, and juice yields of current manufacturing methods are exceeded by the new process.

Further studies with shrinkable polyolefin film to enhance the quality of fresh tomatoes have demonstrated that weight loss and color change were significantly retarded when the tomatoes were individually shrink-wrapped. The wrapped tomatoes maintained a desirable firmness much longer than the control fruits, and the shelf-life of shrink-wrapped, mature, green tomatoes was three to eight weeks at 18 degrees Centigrade as opposed to two to five weeks for the unwrapped fruits. Tomatoes that were shrink-wrapped in two layers of film, which was subsequently removed after two weeks of storage, scored higher than the control fruits as regards eating equality and flavor, while still providing an increased shelf-life. These data suggest that the most desirable procedure may be to wrap the tomato in a higher barrier film that is subsequently removed after a couple of weeks storage.

Finding useful outlets for marketing dark meat has been a continuous problem for poultry processors. Since consumers seem to prefer light tissues of the breast and wing, the so-called “white meat,” research efforts were directed toward methods to “lighten” dark tissues of the thigh and drum. Procedures involving color pigment removal and/or alteration were developed which rely upon washing raw, boneless meats in solutions of “oxidizers,” rinsing the solutions from the meat, and then lowering the moisture content by pressing. Washing with water resulted in a cooked product color that was only 25 percent improved when compared to a breast meat product. However, use of oxidizer solutions, with ascorbic acid giving the best results, resulted in a 50 percent change toward the lighter color of breast meat. Instrumental color analyses and visual color appraisals indicated that the procedure yields meat that could effectively
be utilized in products such as sliceable poultry rolls, roasts and battered-and-breaded “finger” foods.

Osteoporosis, a disease of the bones, continues to be a problem. Studies with female laboratory rats to determine the effects of diets containing commonly consumed protein sources on bone metabolism are being conducted in an effort to provide additional insight into the osteoporosis problem. The disease is characterized by a decrease in bone mass resulting from a disturbance of nutrition and mineral metabolism, particularly calcium.

The quantity of dietary protein had no significant effect on bone consumption or on bone density, but the type of protein consumed did alter femur mineral composition and mandibular density. Tibial density, femur hexosamine or hydroxyproline were not affected. Rats fed diets containing meat protein had a higher femur calcium and phosphorus content and mandibular density than did rats fed diets containing casein, ovalbumin or wheat gluten. This difference may be related to the sulfur amino acid content of these proteins or to some as yet unidentified “meat factor.” Such studies relating to bone metabolism and dietary constituents will continue, and the information obtained should provide means to reduce the incidence of osteoporosis.

Home Economics

During the 1984-85 academic year, five projects involving nutrition, textiles and housing were funded at Winthrop College by the S. C. Agricultural Experiment Station. Three were part of Southern Regional Studies, which included eight Southern states.

The regional nutrition research project, “Nutritional Status of Adolescent Females,” was a three-year study assessing the nutritional health of black and white females in the target group. In the 1984-85 reporting period, dental data were examined to determine the relationships between dental health and the intake of nutrients such as carbohydrates, calcium and vitamins C and D. Results indicated that black females had a greater number of caries (tooth decay) and more carious extractions in permanent teeth than did white females. Whites also had more fillings and better oral hygiene than blacks. Black adolescents included in the study were found to consume a greater number of daily calories, more snacks, and had higher intakes of sugar than whites. As the total amount of carbohydrates consumed as snacks by blacks increased, so did the number of caries in permanent teeth. There were also more caries and more carious extractions of permanent teeth among low income ($2,700 per capita) subjects than high income subjects ($5,701 per capita). Low income subjects also consumed higher amounts of total sugars and sucrose from snacks than did those with high income. Among middle income ($2,701-$5,700 per capita) subjects, as the number of snacks consumed
daily increased, the number of permanent teeth with caries also increased.

Telephone interviews were conducted with selected farm families in York County, S. C., as part of the regional textile project, “Effects of Functional Textile Finishes on Comfort and Protection of Consumers.” Data collected from 69 questionnaires were examined to assess practices used by farmers and their family members in handling and laundering pesticide-contaminated clothing, and to determine the potential contamination of other family members. Ninety-seven percent of the farmers surveyed had peach orchards and sprayed an average of 44 days per growing season. Parathion was the pesticide used most often, and tractor spraying was the most frequently used method of application. Eighty-seven percent of the farmers surveyed indicated they used protective clothing, and 71 percent of these used rubber overalls or rainsuits. Forty-four percent of the farmers stated that pesticide-contaminated clothing was laundered separately; 20 percent responded that pesticide-contaminated clothing was laundered along with clothing of other family members. Ninety-one percent of the farmers surveyed agreed that the benefits of spraying exceeded any risks involved in using farm chemicals.

The regional housing research project, “Barriers and Incentives to Affordable Housing,” was designed to assess the availability of innovative and/or affordable housing in seven Southern states. Communities outside the metropolitan statistical areas with populations between 2,500 and 10,000 were included in the study. S. C. agencies and companies involved in housing were mailed questionnaires in the fall of 1984. With regard to housing design, construction and financing, respondents were asked to classify communities as probably traditional, definitely traditional, probably innovative or definitely innovative. In the initial survey, most of the communities in South Carolina were classified as probably or definitely traditional; four communities, Beaufort, North Myrtle Beach, Surfside Beach and Port Royal, were most often classified as definitely innovative.

Horticulture

In fruit and nut research, orchard floor management has been reorganized and strengthened with interdisciplinary efforts to select species that suppress ring nematodes and which are compatible with other necessary cultural practices. Peach quality enhancement through improved post-harvest handling systems continues at an accelerated pace due to Agriculture Marketing Service grant support of interdisciplinary work between Agricultural Economics, Agricultural Engineering and Horticulture. Peach breeding has a selection with greatly improved spring frost resistance which is nearing commercial release. Kiwi fruit cultural research was established in collaboration with Coastal and Pee
Dee Research and Education Centers. Growth regulator control of shoot growth of peaches and pecans had dramatic effects.

Pickle research was transferred to the Edisto Research and Education Center and reoriented toward greater emphasis on pest resistance and environmental adaptation. Irish potato trials have reintroduced this crop to commercial productions. Potato chippers in Spartanburg, Charlotte and Atlanta have used South Carolina-grown produce. Trials with sweet potato chips and longterm storage of sweet potato puree were initiated.

In turf and nursery crops, water stress research has been strengthened by the addition of microprocessors and facilities for automated root zone measurements. Growth regulators to control overseeded turf transition showed great commercial potential. New textile products to reduce soil erosion during turf establishment were placed under trial with excellent industry grant support.

**Plant Pathology and Physiology**

Control of vegetable diseases was researched from the standpoint of host resistance and judicial use of pesticides. One approach to breeding for resistance is to use biotechnological methods to move the resistance genes from dissimilar species into a commercially acceptable host. Several Cucumis species, some of which exhibit nematode resistance, were cultured and regenerated on artificial media. These kinds of plants will allow for generating whole plants from embryos resulting from crosses of unlike species. The new plants may have the desired resistance.

Four tomato breeding lines with multiple disease resistance, concentrated fruit set, heat tolerance, fruit crack resistance and stake adaptability were selected and advanced to yield trial status. Crosses were made to incorporate southern stem blight resistance and to evaluate jointlessness.

Two tobamoviruses were found infecting tomato. One had characteristics like those of tobacco mosaic virus, the other had characteristics like those of tomato mosaic virus. Using information from other states and virus prevention research results from tobacco projects in South Carolina, researchers developed a virus prevention program that alleviated a serious virus epidemic in some commercial tomato fields.

Pruning time was evaluated for four peach cultivars in relation to premature tree death and plant hormone production. Of 288 trees, 87 died during the experiment. Of the trees that died, 88.5 percent were pruned prior to Jan. 1. Fall pruning induced plant hormone changes, drastically at times, and no alternative was found for waiting until after Jan. 1 to prune. A possible alternative to fall pruning is to prune during the summer months. Data indicated no harmful effects on tree life as a consequence of summer hedging. This practice is being examined further.
Fate of pesticides in the environment is a concern of agriculturists. In a study of the degeneration of the herbicide propanil in anaerobic soil conditions, such as pond bottoms, complete loss of the herbicide occurred within 15 days. Also residue analysis experiments were conducted on peach roots treated with the nematicide Nemacur. Residues in treatments at recommended rates persisted in roots for up to three months. Smaller roots had higher residue levels than did large roots. It is believed that these results can be used to increase efficacy of placement of the nematicide.

Nematodes continued to be a nemesis to many crop plants. A rootknot nematode that causes serious losses in tobacco and soybeans was identified to rate 2 of Meloidogyne arenaria. It was found that there was no resistance to this nematode in tobacco and only fair tolerance in soybeans. It was also found that plants resistant to M. incognita, the more common root-knot nematode in South Carolina, became susceptible when M. arenaria was present. More damage was done to the plant when both nematodes were present.

Several nematicides were tested for control of lance and cyst nematodes. Yields increased when susceptible varieties were treated but not enough to be economically feasible when resistant varieties were treated.

**Poultry Science**

Cracked and broken eggs cause considerable loss to the poultry industry. As the hen ages, egg size increases and shell strength decreases. Shell resistance to breakage is largely but not totally dependent upon dietary calcium concentration. Increases in dietary calcium have been proposed to improve shell quality. Research was designed to examine this hypothesis. A life cycle study (one year) using three commercial strains of White Leghorn layers was conducted employing diets in which all nutrients except calcium were constant. Dietary calcium ranged from 2.75 to 6.5 percent. The results of this study indicated the following:

1. Egg production increased linearly as calcium level increased to 5.75 percent but, was depressed at 6.5 percent.
2. The age-dependent decline in shell weight and shell strength cannot be offset by increasing dietary calcium.
3. Decrease of eggshell strength in large eggs is not due to a constant amount of calcium being deposited over a larger surface area. Additional work is needed to solve this costly and complex problem, and this research will help direct future studies.

In commercial chicken and turkey flocks, the onset of semen and egg production can be manipulated by lighting programs during any time of the year. However, guineas often fail to respond to artificial illumination during the winter months. This problem has been experienced by commercial producers where birds exposed to stimulatory light in February may not start production until May. Our experience indicates that the
problem is not a lack of sensitivity to light, but that the guineas are more sensitive to temperature than other commercial poultry are. Recent work at Clemson was designed to determine if the inability to stimulate guineas into egg and semen production during the winter months is due to temperature, and if so, estimate the minimum temperatures needed to promote sexual maturity. The effects of four temperature regimes on the onset and maintenance of semen and egg production, fertility, hatchability and feed consumption by guinea fowl were examined. From the data, it was concluded that onset of egg production in guinea fowl is influenced by temperature and that a temperature of 22.5 to 23 Centigrade is sufficient for rapid initiation of production. Onset of semen production showed some response to temperature, but the response was limited and of short duration. No significant differences were seen in fertility or hatchability, and differences in feed conversion were due to delayed onset of egg production in the lower temperature regimes.

Storing semen from mammals for future fertilization has been possible for a number of years. However, the search for a viable alternative to using fresh semen for poultry fertilization has met with limited success. Poultry scientists at Clemson have investigated the use of several turkey semen diluents including the Clemson Turkey Semen Diluent, Beltsville Poultry Semen Extender, Lake’s Diluent and Minnesota Turkey Growers Association Diluent. After diluting the semen on a ratio of one to one with the different diluents, oxygen was bubbled through the mixture while it was stored for 24 hours at 12 degrees C. The fertilizing capacity of the semen was enhanced when fluorocarbon was emulsified with the semen and respective diluents. It was found that 60 or 100 percent oxygen provided better fertility than 20 percent oxygen. This research indicates that oxygen carriers, such as fluorocarbon, may be useful to preserve the reproductive capacity of cold-stored turkey semen. They may also provide some benefit as diluent additives for fresh semen.

Branch Centers
The S. C. Agricultural Experiment Station’s four branch centers, formerly called stations, continue to emphasize the specialties of the areas where they are located.

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

The Pee Dee Center near Florence continues to expand crop research on tobacco, soybeans, corn, cotton and vegetables at a new $4 million complex completed and dedicated in the summer of 1985. Studies of aquaculture are also planned at the 2,300-acre experiment center first located in Florence in 1911 at a location that it outgrew. Center personnel breed plant varieties for resistance to diseases, insects, frost and drought.
They also develop better cultivation methods and machinery for harvesting. Pee Dee Center scientists have been responsible for several research developments which brought international acclaim to the center.

The Coastal Center at Charleston emphasizes vegetable research for growers in the Coastal Plains. A large urban research and demonstration area on Highway 76 South provides information to school classes, garden clubs and homeowners concerning flowers, herbs, shade trees, lawn grasses, vegetables and other plants.

The Edisto Center at Blackville designs its research for growers and cattle producers in the Upper Coastal Plains. Field crops such as corn, soybeans, small grains, melons and sweet potatoes are studied, along with cattle.

**Active Research Projects, 1984-85**

**Agricultural Economics and Rural Sociology**

An economic analysis of alternative marketing strategies for cotton producers.

Economic issues in the conversion and protection of agricultural land in South Carolina.

Economics of horticultural crop production in South Carolina.

Impact of changing costs, institutions and technology on the Southern dairy industries.

Improving community services in non-metropolitan counties in the South.

U. S. food demand and consumption behavior.

Local impacts of economic demographic change in South Carolina.

Structural and operational efficiency of the fruit and vegetable production-marketing system.

An economic analysis of risk management strategies for agricultural production firms.

Economics of improving productivity in the livestock-meat systems in the South.

Labor markets and labor force differentiation in non-metropolitan areas.

Disturbances to price discovery-risk management by marketing firms in Southern agriculture.

Economic analysis of the impact of alternative flue-cured tobacco programs.

Monetary, fiscal and trade policy impacts on farm organization.

Socioeconomic dimensions of technological changes, natural resource use and agriculture structure.

Organization and operation of South Carolina water utility systems.

Growth of the South Carolina broiler industry relative to other Southeastern states and the United States.
Agricultural adjustment in the Southeast through alternative cropping systems.
Production and marketing of catfish and crawfish in South Carolina.

**Agricultural Engineering**
Soybean production and management simulation models.
Viability of soybeans in storage.
Optimize production efficiency of animal housing systems in the Southern region.
Irrigation scheduling models for efficient use of water and energy.
Control systems for optimizing tractor energy and fuel consumption.
Physical properties and mechanized sorting of peaches.
Energy reduction for crop production systems.
Effects, mechanisms and control of erosion and sediment from agricultural and forested lands.
Agricultural meteorology and climatology for production in the Southern region.
Control algorithm for two-stage combustors.
Water table management for crop production in the Coastal Plain of South Carolina.
Development of vegetable harvesting systems.
Design of a cord wood gasification and gas combustion system for curing tobacco.
Cultural systems and equipment for mechanization of peach production.
Effect of swine lagoon effluent on hardwood seedling growth.
Methane production potential from farm crops.
Factors contributing to and control of peach tree short life in South Carolina.
Improving tobacco bulk curing systems.
Processing and storage of Southern agricultural commodities.
Engineering and management systems for cotton production, harvesting and processing.
Engineering analysis and design for aquaculture of catfish, crawfish and clams.

**Agronomy and Soils**
Soil properties and nutrient levels in relation to nutrient uptake by corn and soybeans.
Sunflower improvement.
Significance and distribution of mineral components in Southern soils.
Grain yields and field performance of barley, oats, rye and wheat.
Advanced strains and cultivars of cotton, soybeans and peanuts.
Production practices of flue-cured tobacco.
Cultivar performance evaluation of corn and grain sorghum hybrids.
Sulfur and nitrogen components of precipitation and effects on soil fertility and plant nutrition.

Soybean response to irrigation, plant populations and related management practices.

Soil fertility management for irrigated corn and soybeans.

Evaluation, establishment and management of forage legumes and legume grass combinations.

Cytological and developmental studies of soybean and clover hybrids.

Boron retention and availability in soils of South Carolina.

Nitrogen source for production of forages.

Development of improved soybean varieties.

Breeding cotton for improved yield, fiber quality and resistance to insects.

Weed control in corn, cotton and soybeans.

Soybean seed germination under heat stress.

Overcoming factors limiting biological dinitrogen fixation by leguminous plants.

Cellular and molecular genetics for crop improvement.

Chemistry of atmospheric deposition: effects on agriculture, forestry, surface waters and materials.

Release of aluminum from soils by acid precipitation.

Breeding disease- and nematode-resistant flue-cured tobacco for yield, quality and harvestability.

Heat-drought tolerance of white clover stolon meristems (*trifolium repens* L.)

Life history, population dynamics and interference: a basis for understanding weed biology.

Small grain breeding and genetics.

Spatial and temporal variability of soil characteristics and material fluxes in field soils.

Influence of various tillage and cropping systems on integrated pest management in soybeans.

Cultural practices and variety development for flue-cured tobacco.

Rhizobia and microrhizae to enhance BNF in cowpeas.

Growth and nutrient uptake by soybean roots as affected by cultivars and soil properties.

Bacterial extrachromosomal factors controlling *Fhizobium japonicum* soybean symbiosis.

Modifying aluminum toxicity for plants in acid soils.

Breeding cool season forage grasses.

**Animal Science**

Breeding methods for beef cattle in the Southern region.

Marketability and acceptability of beef produced under forage-grain management systems.
Nutrition and management of swine for increased reproductive efficiency.
Reproductive physiology of farm animals.
Endocrine and immunosuppressive mechanisms and maternal recognition and pregnancy in the beef cow.
Physiological role of relaxin during reproductive states in the gilt.
Utilization of forages for production of slaughter cattle throughout the year.
Estimation of pork muscle growth and evaluation of hot processing and chlorine washing for hams.

**Aquaculture, Fisheries and Wildlife**
Feral swine movement, habitat utilization and pig survival.
Management and culture of molluscan species.
Warm water aquaculture.
Dynamics of harvesting a South Carolina Coastal Plain deer herd.
Territoriality and dispersal in the bobcat.
Home range size, movement behavior and territoriality in the beaver.
Home range and habitat use of fox squirrels in the Coastal Plain of South Carolina.
Movement behavior of gray fox and scent station transects validation.
Thermal habitat selection by striped bass in Santee-Cooper.

**Dairy Science**
Optimizing nutritional management of dairy calves.
Influence of ration composition on plasma hormones and lipid metabolism in dairy cows.
Effects of environmental and management stressors on production and reproduction in dairy cattle.
Metabolism, toxicokinetics and physiological effects of aflaxtoxin B in the bovine.
Effects of media, culture and storage on survival of cattle and sheep embryos.
Protein nutrients for ruminants.
Preventing light-induced off-flavor in dairy products.
Development of cold pack and process blue cheese.
Iodine concentrations in milk and milk products.
Metabolic and production response of dairy cattle fed forage-based diets.
Dietary factors affecting the toxic and immune response of ruminants to mycotoxins.

**Entomology**
Ectoparasites of poultry and synanthropic files of poultry, their biology and control.
Biology and control of arthropods affecting man and animals.
Biological control of insect pests and soybeans.
Entomopathogens for use in pest management systems.
Physiological relationships between insects and biological control agents.
Comprehensive, unified, economically and environmentally sound systems of integrated pest management for soybeans.
Control of tobacco insects.
Feral swine movement, habitat utilization and pig survival.
Identification and distribution of insects of potential importance in South Carolina.
Control of vegetable insects in the Piedmont of South Carolina.
Biology and control of arthropods on apples.
Behavior and potential of endemic and imported natural enemies in management of soybean and insect pests.
Biology, behavior, population dynamics and management of peach insects and mites.
Integrated management strategies for insect pests of forage crops and feed grains.
Tactics for management of soybean pest complexes.
Heliothis spp: management systems for field crops.
Bionomics and control of insects on cotton.
Improved systems of management for pecan arthropod pests.
Bionomics and ecology of Heliothis zea and H. virescens on cultivated and wild hosts.
Biology, ecology and control of domiciliary cockroaches.
Bionomics and control of the European corn borer.
Insecticide resistance in insect pests and their predators in cotton, corn, soybeans and tobacco.
Breeding soybeans for resistance to insect and nematode pests.
Biology and control of imported fire ant.
Biotypes of Heliothis zea in South Carolina.

Food Science
Function, nutrient composition, quality, stability and efficient production of poultry products.
Functional properties of proteins.
Effect of dietary phosphorus and calcium on bone metabolism in rats.
Microbiological and process factors affecting quality of fermented sausage.
Maximizing the use, nutritive quality and consumer acceptance of sweet potatoes and their products.
Phytate-reduced and phenolics-reduced soy and peanut protein isolates.
Oral health and nutritional status of noninstitutionalized elderly people.
An energy audit of laboratory animals using a modified whole body calorimeter.
Water hardness and lipid metabolism.
Optimization of thermal processes for conduction-heated foods in retortable pouches.
Dietary fiber effects on protein quality.
Analysis and interpretation of selected South Carolina nutrition survey data.
Interrelationships of diet and physical activity in hypertension.
Effect of gender and feed intake on growth and serum hormones and metabolites of the bovine.
Processing foods by metallic membrane ultrafiltration and hyperfiltration.
Shelf life and quality of individually shrink-wrapped fruits and vegetables.
Urinary metabolites of pyridoxine intoxication in the rat.

**Horticulture**
Development and evaluation of rootstocks for peaches.
Plant germplasm — its introduction, maintenance and evaluation.
Industrial byproducts as container mix components for plant growing media.
Breeding and evaluation of sweet potatoes for fresh market and industrial uses.
Cultural management of centipede grass.
Breeding edible southern peas with resistance to insects and disease.
Urban horticulture for coastal South Carolina.
Breeding and evaluation of watermelon and cantaloupe varieties.
Breeding disease-resistant pumpkins for the Halloween market in the Southeast.
Turfgrass culture and improvement.
Establishment of landscape plants with low resource utilization.
Cultural and management practices of pecans.
Vegetable breeding: developing improved cultivars and germplasm.
Breeding improved stone fruit scion and rootstock cultivar.
Potential new crops and multiple-cropping schemes for vegetable production systems.
Irrigation and fertilization systems for vegetable production.
Interactive microcomputer program for landscape design.
Cultural and environmental effects on strawberry.
Assessment of progress in breeding for soil-pest resistance in sweet potatoes.
Orchard ground cover management systems for peaches.
Trickle irrigation in humid regions.
Evaluation of herbicides to support registration on vegetable crops.
Chilling injury of selected greenhouse plants.
Photosynthesis, carbohydrate distribution and growth in peach trees.
Alteration of stone fruit metabolism.
Breeding and development of multiline varieties of pickling cucumbers.

**Plant Pathology and Physiology**
Forage legume viruses.
Methodology, dissipation and fate of pesticide residue in agricultural ecosystems.
Variability of root-knot and cyst nematodes and factors influencing their population dynamics.
Factors contributing to and control of peach tree short life in South Carolina.
Etiology, epidemiology and control of pecan diseases.
Causes and control of diseases of cereal grains in South Carolina.
Etiology and control of fungal and viral diseases of vegetables.
Causes and control of diseases of ornamental plants.
Physiological responses of plant tissue and cell cultures to plant growth regulators.
A physiological approach to peach tree short life.
Etiology and control of tree fruit pathogens.
Mycotoxins of corn and other feed grains.
Distribution, ecology and pathogenicity of ectoparasitic nematodes of soybeans.

**Poultry Science**
Function, nutritive composition, quality, stability and efficient production of poultry products.
Eggshell quality in avian species.
Serum protein changes in response to the Clemson University fowl cholera.
Vaccine in turkeys.
Protection of domestic poultry against fowl cholera disease using an *avirulent pasteurella multocida* live vaccine.
Nutritional factors affecting metabolism of skin and adipose tissue in meat-type birds.
Effects of ingredients and ingredient processing on production efficiency of meat-type birds.
Nutritional and non-nutritional aspects of leg abnormalities in turkeys and broilers.
Endocrine and physiological effects of heat stress in poultry.
Pathology and control of rabbit liver coccidiosis.
Secretory activity of the avian adrenal and reproductive tract *in vitro*.
Eradication of chlamydiosis, paratyphoid, and avian tuberculosis in pigeons.
Management of guineas.
Feed additives and dietary amino acid requirements for Coturnix and Bobwhite Quail.

Seminal phospholipid concentrations and phospholipase activities during storage to chicken semen.

Effects of Pinealetom on the reproductive physiology of male turkeys.

Preserving turkey and chicken semen, and factors affecting semen production in turkeys.

Web wing vaccination of turkey breeders with an *avirulent pasteurella Multocida*.

Disease survey in turkeys in S.C.

Fowl cholera immunity in breeder chickens determined by the enzyme linked immunosorbent assay.
Experiment Station Publications, 1984-85

Department Research Series
AE 430 — Publications List 1982-83.
AE 433 — South Carolina Cash Receipts from Farm Marketings, 1982 Revised, 1983 Preliminary.
AE 434 — South Carolina 1984 Vegetable and Small Fruit Statistics. State and County Data.

Technical Contributions
2324 — Studies of Neortropical Leptoceridae (Trichoptera), II: Amphoropsyche, a New Genus and Species of Leptocerinae from Northern South America by Ralph W. Holzenthal.
2325 — Pathogenicity and Epidemiology of Corynespora Cassicola in the Republic of Seychelles by Graydon C. Kingsland.
2327 — Interactions Between Root-Knot Nemotodes and Paecilomyces Lilancinus on Tobacco Cultivar NC95 by I. K. A. Ibrahim and S. A. Lewis.
2328 — The Effects of Aging, Deboning and Brine Solutions on Japanese
Quail (Coturnix coturnix japonica) Tenderness by E. T. Legare, G. P. Birrenkott and K. K. Hale.

2329 — Effects of Temperature on Pathogenicity and Interactions of Meloidogyne Arenaria and M. Incognita on the Susceptible Soybean Cultivar Davis by I. K. A. Ibrahim and S. A. Lewis.

2330 — A Decline Disease of Rye in a Lespedeza-Rye Crop System in South Carolina by Graydon C. Kingsland.

2331 — Leucine Transport and Incorporation in Cucumber Roots by N. Dwight Camper.


2333 — Alachlor and Metoachlor Effects on Leucine Transport and Incorporation Into Protein by Margaret E. Sloan and N. D. Camper.

2334 — Studies in Neotropical Leoptoceridae (Trichopetera), III: The Genus Natalina Mosely (Triplectidinae) in South America by Ralph W. Holzenthal.

2335 — Field Surveillance and Laboratory Selection for Pyrethroid Resistance to the Tobacco Budworm in South Carolina by G. T. Payne, B. J. Disney and T. M. Brown.

2336 — Studies on Fungicides for Control of Corynespora Cassiicola Leafspot of Tomatoes in the Republic of Seychelles by G. C. Kingsland and W. R. Sitterly.

2337 — Pathogenicity and Interactions of Meloidogyne arenaria and M. incognita on the Soybean Cultivar Centennial by I. K. A. Ibrahim and S. A. Lewis.

2338 — A Note on Camellia Root Rot and Other Things by Luther W. Baxter Jr., Susan G. Fagan and Peggy A. Mitchell.

2339 — Effect of Alachlor and Metolachlor on Cucumber Seedlings by Margaret E. Sloan and N. D. Camper.

2340 — Procedures for Fungicide and Bactericide Tests for Control of Foliar and Fruit Pathogens of Peach in the Eastern United States by Eldon I. Zehr, David F. Ritchie and Charles R. Drake.

2341 — Response of Turkeys to the Anabolic Agent Trenbolone Acetate by D. V. Maurice, J. E. Jones, J. E. Whisenhunt and D. J. Castaldo.


2343 — The Relationship of Peroxidase Activity to Resistance of Watermelon to Race 2 Anthracnose and Investigation of Its Use in Screening for Resistant Plants.

2344 — The Effects of Aging, Deboning and Brine Solutions on Japanese Quail (Coturnix coturnix japonica) Tenderness — Revision by E. T. Legare, G. P. Birrenkott and K. K. Hale.


Yield and Seed Growth at Various Canopy Locations in a Determinate Soybean Cultivar by S. U. Wallace.


Secretory Patterns of Progesterone and Gonadotropins in the Ovarian Branch of the Ovarian Vein and the Jugular Vein During and Around the Second Trimester of Pregnancy in the Bovine by Christine D. Hamrick and Tomas Gimenez.

A Procedure for Rapid Diagnosis of a Mixed Infection of Iridescent Virus and Nuclear Polyhedrosis Virus in Larvae of *Anticarsia gemma* talis by Peggy J. Sieburth and Gerald R. Carner.

Corn Yield Response to Starter Fertilizer and Sulfur in a Coastal Plain Soil by J. R. Woodruff and H. L. Musen.

Effect of Varying Levels of Postpartum Nutrition and Body Condition at Calving on Subsequent Reproductive Performance in Beef Females by M. W. Richards, J. C. Spitzer and M. B. Warner.

Bone Strength of Cage-Reared Broilers as Affected by Levels of Calcium, Phosphorus and Manganese by C. R. Ruff and B. L. Hughes.

Effects of Temperature on Reproduction in Guinea Fowl by B. L. Hughes.


Tobacco Leaf Richomes and Their Exudates by A. W. Johnson, R. F. Severson, J. Hudson and G. R. Carner.

Peach Skin Discoloration by E. G. Denny, D. C. Coston and R. E. Ballard.

Relationship Between Temperature and Survival of *Aspergillus Flavus* on Naturally Contaminated Corn Grain by Graydon C. Kingsland.

*In Vitro* Responsiveness of the Broiler’s Adrenocortical System by K. D. Smoak and G. P. Birrenkott.
Selection Criteria for Breeding Sweet Potatoes for Industrial Uses by Max G. Hamilton, Alfred Jones and P. D. Dukes.

Studies on Selecting Camellia Scions for Grafting Onto *Camellia sasanaua* to Control Root Rot Caused by *Phytophora cinnamomi* by Luther W. Baxter, Susan G. Fagan and Peggy A. Mitchell.


Observation of an Unusual Occurrence on Camellias by Luther W. Baxter Jr., Susan G. Fagan and Peggy A. Mitchell.

Daily Variation of Corticosterone and Thyroid Hormones in Broiler Cockerels by K. D. Smoak and G. P. Birrenkott.

Frequency and Structure of Macrophages and Abnormal Sperm Cells in Guinea Fowl Semen by R. A. Hess, B. L. Hughes and R. J. Thurston.


Control of Lesser Cornstalk Borer on Florunner Peanuts with Granular Clorpyrifos by J. W. Chapin and W. J. Sullivan.

Effect of Thyroid Hormones on Corticosterone in the Cockerel by K. D. Smoak and G. P. Birrenkott.

Sodium Chloride-Induced Reduction of Abdominal Fat in Broilers by D. V. Maurice, J. E. Jones and A. P. Deodato.

Registration of SCG82C Tall Fescue Germplasm by Eugene F. McClain.

Registration of Piedmont Orchard Grass by Eugene F. McClain.


Experimental Selection for Insecticide Resistance by Thomas M. Brown and Gregory T. Payne.

An Aberrant Female and Possible New Host Record for *Dasymutilla occidentals* (*Hymenoptera: Mutillidae*) by Donald G. Manley.

Changes in Food Consumption for South Carolina Adults by M. E. Kunkel.


Registration of SCG82A and SCG82B Hardinggrass Germplasms by Eugene F. McClain.


The Immature Stages of *Beraea gorteba Ross* (*Trichoptera: Beraeidae*) by Steven W. Hamilton.

2383 — Infectivity of an Iridescent Virus for All Larval Instars of *Anticarsia gemmatalis* (*Lep.*: *Noctuidae*) by Peggy J. Sieburth and G. R. Carner.

2384 — Determination of Toxic Concentrations of Nicotine in an Artificial Diet to Newly Hatched Tobacco Budworm Larvae by Paul Granzow, Tony Shalosky and Albert Johnson.

2385 — Development of *Brachymeria ovata* Say (*Hymenoptera*: *Chalcididae*) in Freezer-Stored Pupae of Lepidopteran Species by Jerome F. Grant and Merle Shepard.


2388 — Soybean Root Growth and Nutrient Uptake As Affected by Lime Rates and Plant Age. II, Ca, mg, K, Fe, Cu, and Zn by J. A. Martini and R. G. Mutters.

2389 — Controlled Pollination Transfer of a Nuclear Male-Sterile Gene from a Diploid to a Tetraploid Watermelon Line by S. L. Love, B. B. Rhodes and P. E. Nugent.

2390 — Improved Procedures for Meristem Culture of Sweet Potatoes by S. L. Love and B. B. Rhodes.


2395 — Vitamin B-12 Nutriture of Chickens Fed Raw Soybean Meal by N. E. Ward, J. E. Jones and D. C. Maurice.


2398 — Induced Parturition in Pigs with Alfaprostol by J. R. Diehl and J. C. Eargle.

2399 — Mites Disrupting Commercial Cricket Operation in South Carolina by Donald G. Manley.

2400 — Foreign Market Promotion Programs; An Analysis of Promotion Response for Apples, Poultry and Tobacco by C. P. Rosson III, M. D. Hammig and J. W. Jones.

2401 — Translation Between Southeastern and California Peach Sizes by M. J. Delwiche and R. A. Baumgardner.

2402 — Ambrosia Beetles (Coleoptera: Scholytidae): A New Pest of Peaches in South Carolina by J. Kovach and C. S. Gorsuch.

2403 — Growth and Carcass Composition of Female Turkeys Implanted with Trenbolone Acetate and Zeranol and Fed High-Protein and Low-Protein Diets by D. J. Castaldo, J. E. Jones and D. V. Maurice.

2404 — Selective Migration and Root Penetraton by Meloidogyne incognita and Hoplolaimus columbus on Soybean Roots in Vitro by D. W. Guy Jr. and S. A. Lewis.

2405 — Plant Growth and Reproduction of Meloidogyne incognita and Hoplolaimus columbus on Davis Soybean by D. W. Guy Jr. and S. A. Lewis.

2406 — An Interaction Between Meloidogyne incognita and Hoplolaimus columbus on Davis Soybean by D. W. Guy Jr. and S. A. Lewis.


2408 — Comparative Costs for Recommended Daily Allowances of Calcium and Protein from Various Foods by J. H. Martin and M. A. Maziar.


2411 — Relationship of Lipopolysaccharide Content to Quality of Pasteurized Fluid Milk by J. R. Bishop, A. B. Bodine and J. J. Janzen.

2412 — Nutrition Information Sources Used by South Carolina Adults by M. E. Kunkel, M. M. Cody, R. J. Davis and F. C. Wheeler.

2413 — Detectability and Detection Limits by Peter M. Burrows.

2414 — Portable Counter Accuracy Differs Depending on Species of Wildlife Monitored by J. R. Sweeney.


2416 — Effects of Dietary Protein on Bone Composition of Growing Rats
As Determined by Biochemical and Absorptiometric Methods by Z. K. Roughhewad, J. L. B. Hoover and M. E. Kunkel.

2417 — Applying Principles of Plant Disease Control to Camellia Canker, Dieback, Graft Failure and Twig Blight by Luther W. Baxter Jr. and Susan G. Fagan.

2418 — Random Foldings of the Noncentral t-Distribution by Peter M. Burrows.

2419 — Seed Dormancy and Longevity of Cowpea (Vigna Unguiculata) by Tim R. Murphy and Billy J. Gossett.

2420 — Abamectin for Tobacco Insect Control by Albert W. Johnson.


2423 — Comparison of Filter Eluted Whole Blood and Serum in Fowl Cholera Serology (Elisa) by A. P. Avakian and J. W. Dick.


2425 — Studies in Neotropical Leptoceridae (Trichoptera), IV: A Revision of Brachysetodes Schmid by Ralph W. Holzenthal.

2426 — Application of New Test Procedures to Surveys: Merging the New with the Old by O. W. Barnett.


2431 — Seasonal Occurrence of Meteorus autographae on Soybean Looper Larvae on Soybean in South Carolina, and the Influence of Host Density on Parasitization by J. F. Grant and M. Shepard.

2432 — Genes Affecting Foliage Color in Citrullis lanatus by B. B. Rhodes.


2435 — Response of Brachymeria ovata (Hymenoptera: Chalcidae) to
Live and Freezer-Stored Anticarsia gemmatalis (Lepidoptera: Noctuidae) Pupae by Jerome F. Grant and Raymond Noblet.

2436 — Nutrient Loading, pH and Calcium Carbonate Equivalent of Acid Precipitation by U. S. Jones and E. L. Suarez.


2439 — Studies in Neotropical Leptoceridae (Trichoptera), V: A New Species of Ampchoropsyche, with a Redescription of the Immature Stages of A. insularia (Flint) by Ralph W. Hozenthal.

2440 — Growth and Development of Dinitroaniline-Susceptible and Resistant Goosegrass (Eleusine indica) Biotypes Under Noncompetitive Conditions by Murphy, Gossett and Toler.

2441 — A Box for Transporting and Restraining Furbearers by T. T. Fendley.

2442 — Running Head; Weighting Functions in RIA Calibration/Variance Weighting Functions in Radioimmunoassay Calibration by T. W. Gettys, P. M. Burrows and D. M. Henricks.

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

Funded by federal, state and county governments, the Extension Service was created in 1914 as a nationwide system designed to carry education from land-grant universities to these people. For 70 years Extension has worked closely with South Carolinians helping them build a better life through dissemination of practical, useful information within its assigned areas of responsibility.

Originally conceived to help rural people, Extension responded to the changing needs of those it served by broadening its scope of activities to include urban and suburban problems.

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

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

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

Agriculture and Natural Resources

Extension programs in this area deal with the needs, interests and problems of South Carolina citizens across a wide and diverse range of areas. In addition to the production of food and fiber, these programs address the management, protection and utilization of water, wildlife, forestland, ornamental plants, public health and community and recreational resources.

Highlights of Extension Agriculture and Natural Resources programs presented to the citizens of this state in 1984-85 follow.
Agricultural Economics-Farm Management Marketing

The function of the Extension Farm Management-Marketing program is to provide educational information and training to farmers, Extension agents, agribusiness and consumers about agricultural marketing, farm and financial management, agricultural policy and international trade. Workshops, county meetings, publications and audiovisual support were the main teaching and training activities.

The major thrust this year centered on the farm financial crisis, how to recognize impending financial stress and how to better manage farm resources to avoid difficulty.

Following are highlights:

1. Held 21 marketing workshops and county meetings.
2. Held 23 farm and financial management workshops and county meetings.
3. Did 15 outlook presentations including the annual outlook conference.
4. Did nine county meetings on farm policy, taxes and estate planning.
5. Conducted five schools for income tax preparers that drew 925 participants.
7. Conducted annual five-day Southeastern Agricultural Lenders School for 31 lenders from four states.
8. Initiated industry-wide weekly peach report, with support from Agricultural Marketing Service and the National Peach Council.
9. Continued emphasis on fruits and vegetables as alternative crops holding 24 county producer meetings.
10. Began cooperative effort with animal science and agronomy departments in promoting beef-forage systems.
11. Completed the $360,000 Kellog project in which personal computers were placed in Extension offices in all 46 counties.
12. With funding from the Chicago Board of Trade, 15 Extension agents received extensive training and a workshop was conducted on agricultural commodity options for 45 agricultural lenders.

Literature development received major educational emphasis. Economic issues influencing farming were updated in “Outlook Updates” and “Management Marketing Memos.” Publications included “Extension Economics Reports,” leaflets and circulars.

Budgets for major crop and livestock enterprises were prepared and used extensively. Specific marketing reports also were prepared for peaches and cotton. Computer programs were written for a wide variety of commodity and management applications.
Agricultural Engineering

An in-depth study of livestock waste lagoons in South Carolina has led to several proposals for change in the present design procedure that should result in longer service and lower maintenance costs for livestock producers. The cooperation of the State office of USDA-SCS and S. C. Department of Health and Environmental Control is necessary to implement the needed changes.

Stray voltage on dairy and swine farms is a problem for both the farmer and the power supplier. Improving wiring practices in accordance with the national electrical code is the most promising solution to the problem.

Revision and updating of all house plans in the cooperative plan exchange is virtually complete. Two new plans developed at Clemson will soon be incorporated in the service and the entire group made more accessible to South Carolina residents.

Clemson Extension agricultural engineers are working on plans for multi-purpose rural fire stations that can also be used for community building.

County staffs across the State have received in-depth training in residential moisture control, which has increased the effectiveness of our delivery systems in this area considerably.

South Carolina 4-H'ers are able to advance their training in computers. More than 180 4-H'ers used 16 computers at 4-H electric or amp camp.

The two safety programs initiated last year were expanded with new publications added to support the efforts. Chainsaw selection and operation programs were again conducted in 15 counties with Extension circular 637 broadly distributed through county offices.

The "Get Fired Up" program, a 4-H in-school fire safety program directed to fifth grade students, was expanded to reach 5,800 youngsters and an estimated 23,000 family members in 16 counties. This program is being expanded to more schools in more counties and will involve State fire professional groups and medical and insurance industry professionals.

A program on reducing runoff of irrigation water and rainfall was introduced. Furrow diking enhances the use of low-pressure, low-operating-cost, center-pivot irrigation systems. Increased emphasis has been placed on protecting water supplies from contamination by chemicals injected into irrigation water. Proper protective devices have been demonstrated.

A small farm irrigation program was initiated and several demonstrations held. The use of computers has increased the efficiency in which soil and water conservation information can be delivered to the Extension audience.

The Agricultural Weather Office continues its service to the State through the use of computer-based communications. Daily farm weather advisories are written and transmitted by 10 a.m. Monday through
Friday. These reach the user over the weather wire and through county Extension offices. Weather summarizations are done weekly for the Crop Reporting Service and the National Weather Service.

Weather data from more than 50 sites in the Carolinas and Georgia are quality checked and stored on the University computer. These data sets, used in pest and crop models, are updated daily from weather wires.

Agronomy and Soils

Each of South Carolina’s major agronomic crops has an Extension educational program involving transfer of the latest research information to producers. This transfer is largely accomplished through the county Extension system, although there is close cooperation and involvement with other clientele groups such as commodity organizations, other government agencies and agribusiness.

Major commodities and their areas of program emphasis for 1984 were:

Tobacco — encouraged use of high-analysis fertilizers and other good management practices to increase quality and reduce costs.

Soybeans — implemented BEAN-AID, a computer program to aid producers with selection of pest-resistant varieties, thus reducing production costs.

Corn — carried out extensive demonstrations showing advantages of latest technology to achieve high yields.

Cotton — with resurgence of interest in cotton as a cash crop, programs stressed attention to good management in achieving high net profits.

Forages — embarked on aggressive educational program on reducing losses from fescue toxicity. Also, with cooperation from other disciplines, implemented extensive test demonstration program on forage management.

Peanuts, Grain Sorghum, Sunflower, Miscellaneous Crops — although statewide acreages are relatively small, effective educational programs were implemented to aid producers in achieving higher yields with less cost.

Several other Extension agronomy programs cut across commodity lines. These include educational activities in weed control, soil fertility management and soil conservation. Considerable progress was made in 1984 in developing computer software to help soybean and cotton producers make higher, more profitable yields.

From an economic standpoint, weeds are the most important single pest group affecting agronomic crops. Agents, agribusiness people and producers need to know how to correctly identify weeds so they can recommend and use herbicides that work effectively. Special field training programs were offered to teach weed identification, proper diagnosis of herbicide injury symptoms and other aspects of weed management. It appears weed management will be the single most important factor in the
growth of conservation tillage in South Carolina. Conservation tillage in row and forage crops helps save soil. The expansion of forage production in the State has had a positive impact on net farm income for many producers. Forage crops, such as alfalfa in the Piedmont, are looked on favorably as alternatives to soybeans and corn, which are struggling as profit crops in some areas.

A cost/benefit analysis is more critical than ever to producers of major agronomic crops in South Carolina. Extension agronomists are working closely with their research counterparts and with specialists in other disciplines to deliver the best and most cost-effective crop production recommendations possible.

Not only do agronomists use conventional technology transfer methods such as demonstrations, bulletins, newsletters and meetings, but efforts are expanding in use of microcomputers. It is anticipated that more time will be devoted to development and implementation of computer-assisted activities for all commodities.

Animal Science

In the fall of 1979, one truck load of feeder calves was shipped from Chester County. In 1980, 479 feeders were grouped and shipped followed by 678 in 1981, 920 in 1982, 1,011 in 1983 and 1,650 in the fall of 1984. Since the organization of the Tri-County Marketing Association, 4,738 steers and heifers have been marketed with an average weight of 544.6 pounds. They’ve brought $61.53 per hundredweight or $355.14 average per head. Probably no other sales in the Southeast and possibly in the nation have enjoyed such weights, 544.6 pounds per calf.

Only medium and large frame calves with average and above muscling are offered for sale. In 1984 the 1,650 feeders averaged 564.7 pounds and $61.77 per hundredweight, or $348.88 per head. Buyers from states as far away as Illinois and Texas say this offering is the highest quality cattle offered anywhere.

When prices at the Chester-Rock Hill sale are compared to weekly market prices, the difference is $10-$30 more per head. This proves that good quality animals that sell for competitive prices can be produced in South Carolina, hundreds of miles from the corn belt.

On February 20, 225 replacement heifers were auctioned for $122,500 or $544.44 per head. Across the scales these heifers were worth $375-$400 each. This was the third sale of this type, and they have been extremely popular and profitable.

Aquaculture, Fisheries and Wildlife

A 4-H catfish cage culture project began this year with 14 4-H’ers from 11 counties participating. The project, which includes feeding, marketing
and product acceptability exercises, is generating considerable interest among both young people and adults.

A commercial catfish cage culture demonstration is under way in McCormick County. This project is to demonstrate commercial aquaculture as an avenue for generating income from farm ponds in South Carolina.

The Aquaculture, Fisheries and Wildlife Cooperative (Clemson University and the S. C. Wildlife and Marine Resources Department) sponsored a three-day aquaculture workshop in Columbia, established a fish disease diagnostic laboratory at Clemson, and began publishing a newsletter, "South Carolina Aquaculturist."

The Cooperative is presently establishing protocol for using S. C. Wildlife and Marine Resources Department and Aquaculture, Fisheries, and Wildlife biologists as resource personnel for county agents. The Cooperative Extension Service and the SCW&MRD will work closely together to service landowners and to conduct demonstrations and workshops.

Community Development

The Extension Community Development program provides educational and technical assistance to communities to improve the quality of life in rural areas. Community Development emphasizes helping community leaders, local governments, organizations and professionals in other agencies solve problems and get maximum benefits from community resources.

Through the requests of city councils and elected officials, leadership surveys were conducted in rural towns to identify needed community services and local leaders. The results of these surveys have led to the development of recreation facilities, recruitment of new businesses and increased interaction between elected officials and local leaders.

Extension cooperates with the Governor's Office to conduct the annual Emphasis/South Carolina program through which outstanding community efforts in beautification and community improvement are recognized. This year's program attracted 300 people from 35 counties.

The Soil Conservation Service provides funding for a half-time Community Development specialist with the Lowcountry Resource Conservation and Development Program. Extension activities in Resource Conservation and Development are primarily in program planning and public education about the program through electronic and print media.

Community Development held educational programs for elected officials and fire chiefs to show how insurance premiums can be reduced when rural fire protection is provided. Assistance was given to six towns in organizing rural fire districts.

With the Governor's Office of Rural Improvement, a three-day lead-
ership training session was presented for 75 council members, mayors and local leaders.

In many rural towns, downtown businesses are struggling to survive. As they lose sales, there is less tax revenues for local governments. In an effort to reverse this trend, Community Development helped prepare comprehensive downtown revitalization studies and plans for Allendale and Bishopville. Meetings were held with town councils and business owners to develop plans for downtown revitalization.

Microcomputers offer small towns an inexpensive form of technology for word processing, accounting and data management. Microcomputer training was provided for several town managers and staffs.

Dairy Science

More than 30,000 dairy cattle in South Carolina are enrolled in the Dairy Herd Improvement program (SCDHIA). In coordination with SCDHIA, the 11 DHI associations and through the 20 SCDHIA supervisors, Clemson’s dairy scientists give leadership and guidance to the educational activities of this vast record keeping and management system.

The dairy science faculty and staff organized and conducted the 1984 dairy conference at Clemson which was attended by 150 persons. Extension dairy scientists are in the final stages of the residue avoidance project, which is making producers aware of the public health aspect of antibiotic and chemical residues in milk and meat. Tests have been developed for rapid detection of antibiotics in milk so the milk can be checked before it is shipped. Each load of milk is checked for antibiotics, and periodic checks are made for pesticides and other agrichemicals.

A bimonthly program has been initiated to check cull cows for information on various conditions that affect reproduction in cattle. In addition, a seminar on reproductive management to help dairymen improve the reproductive efficiency of their herds was presented at nine locations.

A recent change in regulations requires that somatic cell counts of milk from the farm not exceed one million cells per milliliter. Dairymen and Extension specialists have begun a concentrated effort to develop mastitis control programs that will enable all producers to stay within the limits.

Dairy science meetings conducted at 10 locations drew 15 producers and Extension workers. As a result of these meetings, more producers have requested least-cost feed formulations and ways to improve forage production and quality.

Six meetings and 25 individual consultations were held to advise Sumter area dairymen on the use of wet corn gluten feed in dairy rations. Wet corn gluten is a by-product of a starch plant in nearby Kingstree. The use of this product in dairy rations has cut feed costs 10 percent on the 10 cooperating dairies.
More than 500 least-cost dairy rations were formulated by Extension dairy specialists and area agents. In addition, more than 1,500 feed and forage samples were submitted for chemical analysis.

Extension dairy scientists worked with dairy organizations on marketing, merchandising and promoting milk and other dairy foods. Meetings, field days and individual consultations were conducted throughout the year to assist with forage production, harvesting, storing and feeding. Forage utilization is one of the most critical areas today for South Carolina dairymen.

**Entomology**

Cucurbit production in South Carolina has become an area of increased emphasis for Extension entomology. With 33,000 acres in these crops, they have become a significant part of our vegetable acreage. Cucumbers, totaling about 15,000 acres statewide, have been selected for a pilot Integrated Pest Management (IPM) project in the Midlands. According to the industry, 20 to 30 percent of production is lost to various pests. An IPM program that attempts to cut losses of fall pickle cucumbers is under way in three counties. The project encourages growers to practice the best, currently available pest management practices for pest damage based on field monitoring. Information from this project can be used if IPM projects are set up for other cucurbits such as cantaloupes and watermelons.

Hesian fly became an explosive wheat problem in the Southeast in 1984 with losses estimated at $25 million in Georgia alone. Clemson entomology efforts in 1984 resulted in understanding the life cycle of this pest, discovering resistant variety alternatives and grower education on how to manage the problem. Another devastating pest, the Southern corn rootworm, is an annual problem for peanut growers. Clemson entomology research and demonstration programs in 1984 showed South Carolina growers how to save $10 per acre in managing this pest.

**Food Science**

Extension food science program activities included 75 on-site food processor plant advisories dealing with processing techniques, equipment, packaging and sanitation quality assurance problems; plus another 123 informational responses to food processors, Extension personnel, citizens and state agencies (both in and outside South Carolina). This represented an estimated value of $1.5 million to clientele in improved processing efficiency and product quality, reduced spoilage and less food-borne illness.

Examples of project accomplishments include completion of a product processing feasibility demonstration enabling a small processor to expand its product line and increase sales about 30 percent. Other demonstrations
established safe commercial canning schedules for six meat and poultry products representing about $600,000 in annual sales.

Fifteen new venture advisories were provided to help clientele in the development of facility layouts, processing/preserving procedures, packaging options and compliance with state and federal regulations to commercially process canned peaches, seafood spreads, rabbits, cole slaw, chocolates, apple cider, catfish stew, health foods and various sauces and dressings.

Two new capital venture commitments totaling about $150,000 for the manufacture of taffy and pickled okra incorporated recommendations provided by Extension food science personnel.

Other project activities included reactivation of a sanitation workshop program that provided 216 employee contact hours of training resulting in an estimated five percent reduction in product returns and complaints for a meat processing firm. In addition, on-site processing advisories were provided 12 community canneries sponsored by high schools and low-income agencies.

More than 3,100 notices of proposals, changes and new federal/state regulations were distributed to 1,050 South Carolina food industry companies by the Extension food science food regulation information filter center. Educational information on honey, bananas, food additives and commercial food processing regulations was developed for release to the news media, a trade journal and five Extension publications reaching an estimated 750,000 South Carolinians.

Other activities included providing leadership in several food processing, trade and professional associations and serving as the Institute of Food Technologists regional communications representative for South Carolina.

Forestry

Two years ago Forestry began a project to work with landowners to form county level forest landowner associations. There are nine active associations to date. Landowners are considering forming associations in five additional counties. These associations are developing local leadership to address forestry needs and are rapidly expanding educational programs for landowners.

A new effort under way at Clemson is for the production of high quality one-minute television news spots for use by public and commercial television stations. Forestry has taped six news stories on topics such as selection and use of wood products, tax considerations in forestry and efforts under way to correct declining tree growth. With additional communications resources, this effort could be expanded and would further enhance the image of Clemson University within the State and the region.
Extension Forestry and the Tree Farm program have developed a Master Tree Farmer program. Tree farmers receive 25 hours of instruction in exchange for 25 hours of volunteer service. Nine tree farmers completed the first training session this spring. A second program will begin this fall. This program offers unlimited opportunities by using volunteers to improve the management of forest lands.

Integrated pest management continues to be an emphasis area. Full development of this program could result in the reclamation of more than half of the tree mortality each year. Activities this year include identification of *Fommes annosus* acceptable sites in Bamberg County, initiation of a pest alert series of rapidly expanding CUFAN computerized communications program and a forum for professionals on integrated pest management.

**Horticulture**

The majority of questions directed to the Clemson University Cooperative Extension Service are related to home grounds and gardens. A team of county personnel, area agents and State specialists is used to provide homeowner information. Television programs have been developed and distributed to 11 commercial stations and 140 cable stations in 7 Southern states. Radio programs are distributed to 75 stations in 4 states. Furthermore, Master Gardener volunteers assist with distribution of basic horticulture information to thousands of clients.

Grower demonstrations were used extensively in 1984-85 to demonstrate new techniques to growers and field staff. In-service training by specialists is another education method used to up-date field staff in the area of small fruits, nursery production, turf and vegetables. Static and non-static exhibits were prepared for garden shows, plant problem clinics, fairs and other special interest areas.

Two faculty members were assigned the responsibility of making arrangements for and received a grant in support of a national symposium on post harvest physiology of peaches. Clemson also hosted regional and state short courses in the area of peaches, nursery crops, floriculture and turf during this reporting period.

Electronic communication with microcomputers transmit messages from Clemson to county Extension offices and Experiment Stations that are equipped to receive electronic communications. Recent funding should improve this method of communications and make it available to every county.

**Plant Pathology and Physiology**

Nematodes were the group of disease-causing organisms that were the most damaging in 1985 when all crops were considered. In response, Plant Pathology and Physiology specialists developed a new and improved set
of nematode threshold guidelines, and growers were encouraged to presample for nematodes and use the nematode section of the Agricultural Service Laboratory for analysis. A survey was made of soybean fields in the Coastal Plains for root-knot nematode species and races so that control parameters could be set. An intensive in-service training for county personnel on nematodes affecting major crops of South Carolina was held during the winter months. Follow-up surveys are planned for 1985.

An Extension-sponsored fall cucumber IPM program was initiated in Barnwell County and proved to be very profitable for growers. This program will be continued in 1985 with partial funding by growers. The program should be totally grower supported in 1986.

More than 100 tests for fungicide resistance of the fungus that causes fruit rot of stone fruits (mainly peaches in South Carolina) were made for growers in 1984. An educational program was initiated to give growers background information on why and how resistance to fungicides develops, and alternatives for managing the disease were presented. Losses to diseases in the peach industry were documented, and the results were presented to research personnel for their planning.

Several demonstrations were established in the Pee Dee region on control of nematodes on corn and tobacco. Field days were held for educational purposes and the data used to illustrate the value of nematode analysis and control applications.

Educational programs are part of continuing efforts of Plant Pathology and Physiology specialists. In 1984, concentration was directed toward disease diagnosis within established integrated pest management programs. County Extension personnel, growers and industry representatives were included in organized presentations and demonstrations.

The Plant Problem Clinic made 3,813 diagnostic inputs in 1984. All counties utilized the clinic; the least number submitted by a county was four and the most was 235. Disease, insect, nematode and weed identification were the most requested services. Problems involving nutrient deficiencies, soluble salt analysis and water analysis also were handled. Nine departments actively participated in solving grower problems.

**Poultry Science**

Poultry and egg price levels responded to supply and demand creating record high income levels for the South Carolina industry. Farm market values for poultry and poultry products reached $207.1 million in 1984, the largest individual farm commodity in the State. The South Carolina poultry industry continues to expand to meet market needs, especially in the areas of turkeys and further processing of poultry products. Extension has developed computer projection programs that are available through county Extension offices to the growers and to the industry to project cash
flows and anticipated returns. The growth of the industry has created a demand for advice on entering or expanding all areas of poultry production.

Industry-wide seminars covering all segments of production along with individual meetings have served the industry educationally and improved public relations with the industry leaders.

4-H poultry teams and individuals represented the State well in regional and national competition.

Sea Grant Marine Extension Program

The Sea Grant Marine Extension program is a marine outreach of the Sea Grant Consortium and the Cooperative Extension Service at Clemson University. It has a staff of four specialists who cover five major program areas, including commercial fishing, coastal aquaculture, coastal recreation/tourism, coastal resource management and marine education. The MEP coordinates extensively with other agencies such as the National Weather Service, the National Marine Fisheries Service and the American Fishing Tackle Manufacturers Association. The following are some examples of MEP accomplishments for the past year.

A commercial fisherman came to MEP with a request for information on Golden Crab. This is a large species of deep water crab that was not harvested in South Carolina until the Sea Grant Marine Extension program became involved. Following this initial contact, MEP helped arrange an exploratory cruise on the R/V Oregon which showed that there may be significant amounts of crab available. Since this initial, exploratory cruise, there has been some commercial exploration by fishermen, and a large scale research project has been awarded to the SCW & MRD to help define the limits of the stock. Sea Grant has added funding for this project through the SGMEP funding.

For the third year in a row, the total poundage of crawfish for South Carolina has doubled, bringing the total to 500,000 pounds for 1984-85. The Sea Grant Marine Extension Program has worked extensively with individual farmers and the Crawfish Growers Association to help bring this growth about. The Sea Grant Marine Extension program has also set up demonstrations of the fastest growing techniques for saltwater shrimp. Now the coastal constituent and the Cooperative Extension Service have access to proven management techniques.

The Hilton Head Billfish Tournament was assisted in its management this year by MEP. Part of this assistance included an evaluation of the tournament’s economic impact on the area. When the report was completed, it indicated a $472,000 impact on Hilton Head for this one tournament alone.

The Sea Grant Marine Extension program has also arranged for a national museum of fishing tackle to be located in South Carolina at the
longest fishing pier on the East coast which Sea Grant Marine Extension also helped construct.

In cooperation with the local Propeller Club, Extension helped set up a new Student Port club at the College of Charleston. This club will allow college level students to interact directly with the maritime industry and find out if there is a career they might want to follow before they leave college.

Extension Home Economics

Scope of Activity

Home economics is the only discipline that considers physical, technological, social and psychological factors within the context of the family. Extension Home Economics is committed to helping more than three million South Carolinians understand that the future of our State, nation and world is dependent on strong families.

Extension Home Economics programs center on five major areas: family economic stability and security, energy and environment, food and health, family strengths, and social environment and leadership development. Helping people stay in control of their lives and manage adequately in an increasingly technological world is a challenge for Extension educators.

A brief overview of each subject area follows:

Family Life and Human Development

The home is a microcosm of the larger world. Fifty percent of what a child knows is learned before school age, and the school system usually does not improve the child’s intellectual skills above the level at which he/she enters the system. South Carolina has experienced 11 percent unemployment, and all families have been under economic stress. People are searching for ways to strengthen families and individuals.

When tested, 126 children had an average gain of 10.86 points on the cognitive and perceptual skills (CAPS) evaluation device. Parents of these youngsters learned that they are their child’s best teacher. As a result of several series of leaflets, individuals reported behavior change in their lives as follows: “Baby Talk” . . . 1,600, “I Am a Person” . . . 300, “Planning Ahead” . . . 100. In one program on stress, 80 participants reported intended behavior change.

Clothing and Textiles

Economic pressures have resulted in individuals/families looking for alternative ways to clothe their families on less. Clothing construction is one means through which many families are able to stretch their clothing budgets. With women working outside the home, additional clothes are required and time is of utmost importance.
Reports from 59 percent of the counties indicated a total of 66 restyling classes assisted 808 individuals. Counties estimated that 677 garments were restyled. The savings of these clothes and cost of classes were estimated at $27,325. A total of 242 other construction classes with 2,079 participants resulted in savings of $43,781. This combines the savings in garments constructed as well as the cost of the classes. Additional savings of $16,690 were estimated as a result of answering questions on stain removal. Other non-construction classes have assisted families in stretching their income. A total of 112 classes had 2,462 participants. At a minimum savings of $5 per person, the savings would be $12,310.

**Family Resource Management**

Although unemployment is down in South Carolina, there are still a number of counties with high unemployment rates. In addition, there is much underemployment. These factors, along with the State’s low median income and the nation’s financial environment, have created a situation where South Carolina individuals and families must make wise decisions to maintain or improve their quality of life.

During 1984, 22 counties conducted programs directed toward helping families and individuals better use their resources. Buying power was increased by $224,796 as: (1) 6,672 persons learned and applied new skills in managing resources in clothing, home furnishings, household equipment and housing; (2) 2,624 persons used wise shopping techniques and credit practices; (3) 2,318 persons employed skills in decision making and sound financial management; and (4) 937 persons exercised their rights and responsibilities as consumers.

**Food and Nutrition**

The food and nutrition program has concentrated on two areas — nutrition as it relates to good health and wise use of food resources.

This State has the highest infant mortality rate in the nation. More than 35 percent of South Carolina’s adults are obese, and weight control through proper food habits and exercise has been a major educational program. According to a new survey, more than 60 percent of all South Carolina households preserve food at home. The value of this food is estimated at $78 million. The survey found that a fourth of this food is processed by unreliable methods.

With surveys showing South Carolina has the lowest life expectancy rate in the nation, three South Carolina organizations joined forces to market a new concept in nutrition education. Clemson Extension is working with the American Red Cross and the S. C. Department of Education’s office of school food services in presenting a 12-hour nutrition course to adults as part of a national pilot study called "Better Eating for Better Health." One hundred Extension home economists and se-
lected county school food service supervisors were trained in program instruction, and by October all counties had taken part in the project.

Healthy Mothers-Healthy Babies, a national pilot study, is being conducted in South Carolina to try to reduce the infant mortality rate. Nationally this effort involved more than 50 public and private agencies.

Several other significant programs have been accomplished this year. A new weight control program entitled "Diet Puzzle" has begun. As part of the program, Extension informed 500 fair participants of deficiencies in food products they were entering in fair competition. More than 25,000 questions about food preservation and food safety were answered in five months.

Expanded Food and Nutrition Education Program

The Expanded Food and Nutrition Education Program (EFNEP) reaches limited resource families, especially those with children, and emphasizes the acquisition of skills, attitudes and changed behavior necessary to improve their diets. The program operated in 34 counties in 1984, reaching 6,084 homemakers in the adult program and 6,035 youth in the 4-H program. Volunteer participants in EFNEP in 1984 totaled 910. The value of their services was about $52,000.

Through lessons and picture recipes prepared by the State home economics staff and taught by paraprofessionals, 74 percent of the homemakers reached have improved their diet. Eighty percent of the enrolled homemakers are producing some of their foods at home and are preserving some of this. Ten percent of the EFNEP homemakers are enrolled in, or participating in, Extension Homemakers Clubs or special interest programs.

Interior Design and Home Furnishings

Housing and interior design requires a major part of the income of each family, and all 46 counties offer Extension Home Economics programs on housing and interior design. People in all counties were trained by Extension agents and volunteer leaders in home furnishing skills. This training stressed alternative methods for making homes more livable without heavy cash expenditures.

In home repairs and maintenance, one county reported 500 families received home repair information, 300 requested more information, 20 women learned repair skills in class, eight saved $1,500 by doing small repairs.

Eight counties reported a total of 100 projects in remodeling and home improvement. One county reported that 15 volunteer leaders taught 40 senior citizens and low income families effective kitchen storage; 100 homemakers saw a learning center on clutter and storage. In another
county, 400 families gained conservation knowledge and skills, 66 reported lower utility bills and 15 added more insulation.

**Leadership Development**

South Carolina's population increased 20.4 percent over the 1970 population to 3,119,298 in 1980. This indicates an increase in the potential audience needing Extension Home Economics information. Reductions in appropriations and staff have emphasized the need for volunteer leadership development to continue and expand the impact of the Extension Homemakers organization.

The South Carolina Extension Homemakers Council has active councils in 43 of the 46 counties with 421 clubs and 6,533 members. Membership has increased steadily each year from 5,068 in 1981. The remaining counties are expected to organize county homemakers councils this year.

Six sub-district in-service training meetings were conducted in 1984 by the State advisor. The conducting of 26 leadership training workshops was completed in 1984 by volunteer leaders. It is estimated these workshops cost about $34,000 in volunteer time and $8,000 in professional time. The estimated return during one year is more than $300,000 in volunteer time expended by newly trained leaders.

**4-H and Youth Development**

The mission of the 4-H and Youth Development Program is to help youth 9-19 in South Carolina become self-directed, productive individuals who can make a positive contribution to our State and nation.

The learn-by-doing approach to the 4-H educational curriculum activities enables youth to participate in programs of interest, acquire relevant experiences and evaluate these experiences in terms of potential careers. The research knowledge of the land-grant college is made available to South Carolina youth through 4-H.

**Participation**

The most successful 4-H programs are accomplished through organized community 4-H groups with an adult volunteer and/or teen leader to provide guidance. In South Carolina, 3,433 adult volunteer and teen leaders gave leadership to 4-H programs in 1984. There were 25,219 youth ages 9-19 enrolled in 1,223 4-H clubs, and 33,722 youth enrolled in special interest programs. 4-H is made available to all youth regardless of race, creed, sex or national origin.

In 1984, 7,251 youth participated in the 4-H camping programs conducted at Camp Bob Cooper and Camp Long, and 6,305 youth were enrolled in the Expanded Food and Nutrition Education program. The
most popular 4-H projects in 1984 were Food Nutrition, Personal Development, Clothing, Electric Energy and Safety.

Approximately 5,721 4-H youth lived on farms; 31,993 lived in towns with populations under 10,000 and rural non-farm; 7,640 lived in towns and cities with populations of 10,000-50,000; 6,223 lived in suburbs or cities with populations greater than 50,000; and 2,187 lived in cities with populations exceeding 50,000.

Program Emphasis

The primary emphasis of the South Carolina 4-H and youth development program continues to be for county Extension professionals to recruit, train and support adult and teen leaders. This emphasis is essential to expand and enhance educational learning experiences for more youth and to make the best use of tax dollars allocated to the 4-H program.

Curriculum areas in 4-H include production, processing and distribution of food and fiber; human and animal nutrition; conservation of natural resources; citizenship/community service; leadership development; health; and family living. These are delivered in cooperation with academic departments at Clemson University.

Four years ago, the South Carolina 4-H Foundation was formed as a component of the Clemson University Foundation system. One of the goals of the Foundation continues to be to increase support of 4-H from the private sector. A $1.25 million campaign has been launched to secure additional funds for 4-H in the next five years. Plans are being completed to identify 4-H alumni across the State.

County Extension agents who have recruited, trained and supported adult and teen leaders enable more youth to receive positive learning experiences through 4-H. The leadership skills developed by adult and teen leaders prepare them for other leadership positions in their county and state.

Special Programs

The Extension Service has been charged with the responsibility of translating scientific knowledge from university and experiment station research into useful application on farms, in homes and communities. Despite the trend toward large, sophisticated farm operations, small family farms with limited resources still make up a substantial portion of the State’s rural population. The Special Programs area assists those with low incomes and limited resources. Extension personnel are used to identify problems and establish objectives in crop and livestock production, marketing, nutrition, housing, youth development and family life.

Small Farms Program

The small farm is defined as a farm operated by a family that provides
most of the labor and management, depends on that operation for a significant part of their income and has total income below the median non-metropolitan family income for the State.

Today Extension relies heavily on videotapes, computers and other forms of mass communication to reach large audiences. But on-farm demonstrations are still very much a part of Extension work with small farmers. Tours and field trips with groups are also being used as more effort is being made to reach the small scale farmer with educational information.

The integrated pest management program involved the small farmer and home gardener during the year. Trained scouts scouted insect activity in selected areas. Their findings were reported and published so other producers would know what insects were a problem from week to week. Demonstrations on the control of parasites in livestock were also carried out for small farmers under the integrated pest management program.

Marketing

Selling the farm product is a very serious problem for the small farmer. Low volume and lack of product quality work against marketing efficiency. Considerable time and effort are being given to help growers of horticultural crops to increase quantities by assembling products at a designated place for sale direct to customers. Most counties now have such markets, and it is estimated these markets bring in more than $2 million annually to more than 1,000 small farmers.

Small Farm Project Management Team

Many small farmers in the State were reached through Extension Special Programs cooperating with the Governor’s Council on Rural Development and other agencies through demonstrations of drip/trickle irrigation. This is a method of applying irrigation water directly to the root zone of plants. It operates with low water pressure, low volume and uses less than half the water and energy of overhead sprinkler irrigation systems. These demonstrations showed primarily the benefit of a well-oriented approach to managing small acreages of high value cash crops.
DIVISION OF REGULATORY
AND PUBLIC SERVICE PROGRAMS

L. H. Senn, Director

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

The division 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, Boll Weevil Eradication, Bee Disease and Abandoned Orchards Acts and imposes quarantines when needed.

The division also was given the responsibility for enforcing the S. C. Pesticide Control Act and the S. C. Agricultural Liming Materials Act of 1976.

Following are highlights of division activities for 1984-85.

Department of Agricultural Chemical Services

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

The department performed more than 43,000 analyses for the S. C. Agricultural Experiment Station. In addition, the Agricultural Service Laboratory processed more than 85,600 soil samples, 4,500 plant and feed samples and 8,300 samples for nematodes.

Plant Pest Regulatory Service

The Crop Pest Act

Nursery Inspections: A total of 520 nurseries, greenhouses and vegetable transplant growers and 773 nursery dealers were licensed to sell plant material, including eight dealers outside the State. An additional 358 establishments were visited on routine inspections to determine compliance with quarantines and regulations to provide assistance with pest...
problems. Twenty-four other nurseries were not certified on the initial inspection due to pests and/or weed problems.

**Phytosanitary Certification:** More than 200 phytosanitary certificates (102 State and 109 federal) were issued for various agricultural planting seed, flue-cured tobacco and plant material, primarily orchids and chrysanthemum and rhododendron cuttings destined to other states, Canada and other foreign countries.

**Miscellaneous Inspections:** Forty-eight regular certificates of plant inspection were issued for assorted houseplants being moved or shipped within the United States. Inspections of tobacco plant beds were made for 26 Pee Dee area growers in connection with North Carolina’s import permit requirements. Due to a plant shortage, the North Carolina Department of Agriculture approved more than 150 applications to import plants from South Carolina alone.

**Sweet Potato Inspections:** Sixty inspections, including storage, plant bed and field inspections, were conducted for about 23 growers in the Pee Dee, Sandhill and Coastal Plains areas of the State.

**Phony Peach:** The 1984 survey for phony peach disease was conducted in 14 counties. Six temporary inspectors were hired. Approximately 1.7 million trees were surveyed with 460 (.02 percent) found diseased. Several cases of rosette also were found.

**Abandoned Peach Orchards:** A circuit court hearing was held in Lexington County on peach orchards abandoned by a grower in Edgefield County. The grower was financially unable to treat and maintain the orchards under a good, sound management program. As a result, brown rot disease was evident in all areas of about 600 acres of neglected trees. PPRS personnel attended the hearing to provide information and assistance with technical aspects of the problem. The judge ordered treatment and maintenance of the orchards or removal of the trees. Lending institutions and other growers agreed to treat and maintain some of the trees and others were destroyed.

**Bee Disease Act:** Of the 1,949 bee colonies inspected, five were infected with disease. A total of 8,601 colonies were certified to movement to other states. More than 425 other beekeeper contacts were made regarding various bee problems. Numerous educational activities were conducted during the year including presentations, news articles and demonstrations.

Findings of the acarine mite (A. woodi) in the United States instigated a nationwide alert for this pest. Numerous bee samples were collected from various beekeepers across the State and analyzed for acarine mite. Thus far this pest has not turned up here.

**Cooperative State-Federal Programs**

The department and USDA renewed the cooperative agreement in
1984 whereby the State would hire seasonal employees. Fifty-six employees were hired to survey and perform control activities. Most began work in the spring with additional employees hired during the summer. All were terminated at the end of the federal fiscal year.

Witchweed: Statistics for 1984 show that three new farms with 338 acres were infested with witchweed. More than 5,400 actual and about 9,800 aggregate acres were treated. A total of 83 farms and 2,590 acres have been released from quarantine. Remaining infested farms and acres are 1,204 and 31,570 respectively.

Imported Fire Ant: Small isolated infestations exist in Anderson, Greenwood and Oconee counties. Control measures using a combination of materials including Amdro, Pro-Drone and dursban aerosol soil injection were applied to the areas or visible mounds last fall and again this spring. However, additional treatments are needed to eliminate active fire ant mounds.

Gypsy Moth: In 1984 a total of 207 adult male moths were caught in South Carolina. This compared with 177 in 1983. Of these, 169 were caught in Horry County. One adult moth was found in Laurens County, the first ever found there. Seven larvae were found in May, three at a Jasper County campground and four at a campground in York County. A single pupa was found at the York County campground in June. Numerous inspections were conducted of outdoor household articles moving into the State from high risk areas.

Boll Weevil: The boll weevil eradication program progressed a little smoother in 1984 and 1985 as compared to 1983. USDA, Plant Protection and Quarantine personnel are very pleased and confident with the program at this time. Weevil counts were considerably lower this year. In fact, only 74 fields (1,893 acres) in the eradication zone, which includes both South and North Carolina, have been treated. Results are promising as the diapause season approaches.

Problems surrounding the two lawsuits are continuing as well as problems with certain individual growers relative to unpaid assessments. Overall, the program is eliminating the boll weevil, and the majority of cotton growers are satisfied and supportive of its efforts.

National Plant Pest Survey and Detection Program

Japanese Beetle: Trapping was conducted in Abbeville, Newberry, Orangeburg, and Sumter counties with catches in each. Due to the large numbers in Abbeville County, the entire county was considered infested and included in the quarantine.

Cereal Leaf Beetle: Specimens were collected and identified from Darlington County, a first for this county.

South Carolina Pesticide Control Act

In an effort to improve its education and enforcement capabilities, this
agency has pursued external sources of funds where possible without decreasing the flexibility of the pesticide program. These efforts have resulted in two grants totaling $128,700 from the EPA. The department has also made a concerted effort to increase efficiency by using state-of-the-art data management.

Registration: In 1984 a total of 676 companies registered 7,002 pesticide products for sale in South Carolina. A total of 1,838 pesticide samples were collected and analyzed with 11 found deficient in the guaranteed percentage of one or more ingredients. Stop-sale notices were issued on all deficient products. Registration fees totaling $121,275.25 were deposited.

Using provision of the Federal Pesticide Control Act, the department issued seven Section 24 (C) special local need registrations. No Section 18 emergency exemptions were issued.

Certification: Pesticide dealers and applicators must be certified and licensed to buy, sell or apply pesticides classified for restricted use. Last year 13,390 private applicators licenses, 1,653 commercial applicators licenses, 743 non-commercial licenses and 407 pesticide dealers licenses were issued. Certification fees totaling $88,485 were collected.

Education and Enforcement: Pesticide personnel made frequent contact with pesticide dealers, Extension chairmen and various applicators and pest control operators. Numerous structural pest inspections were conducted. The promulgation of structural pest control regulations in 1980 and mandatory licensing in 1983 has significantly increased the workload in this area. But this is providing a valuable service to both the industry and consumers. Although strong enforcement measures were required in a few instances, most pest control companies are voluntarily correcting violations and re-funding charges for unnecessary pest control activities.

Twenty civil penalties ranging from $50 to $250 (total $1,600) were assessed, and 12 criminal prosecutions resulted in convictions. Forty-six investigations were conducted of potential pesticide misuse. Numerous stop-sale notices were issued for unregistered products, sale of restricted products by unlicensed dealers and other violations. One hundred twenty-two warning letters were issued. Overall, compliance with the act by members of the agribusiness industry has been excellent.

Department of Seed Certification

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

Clemson University was designated by law in 1945 as the agency for inaugurating and carrying out a program of certification of pure seed and plants in South Carolina. The Seed Certification Department of Clemson and other seed certification agencies in the United States must comply
with standards for certification of seed in Federal Seed Act Regulations. Departmental field work in 1984-85 involved inspections of 63,310 acres of crops for certified seed production. Inspections included 75 varieties of 13 crops for 318 farmer/growers and 28 seed-producing firms. Each field was inspected to determine that the crop was true to variety and free of noxious weeds.

Major acreages of crops inspected were soybeans, 42,981; small grains, 17,561; and cotton, 2,025. In addition, other field work involved grow-out plantings of 339 samples of South Carolina certified soybeans and small grains for comparison to producer or processors’ samples of the same seed lots. Only 10 of the samples were found to have varietal purity or labeling problems. This work, in effect for four years, indicates the excellent job certified seed producers and processors are doing in obtaining representative samples of their seed.

During 1984-85, 1,082,912 certified seed tags were issued to growers whose seed met standards both in the field and the laboratory. Four facilities were inspected and approved during the year for custom processing of South Carolina certified seed.

Department of Fertilizer Inspection and Analysis


Some of the major activities of the department for the July 1, 1984-June 30, 1985 period follow:

- **Fertilizer usage data — tons** ............... 693,652
- **No. of fertilizer samples procured and analyzed** ...... 6,302
- **No. of fertilizer samples not meeting guarantee** ...... 1,251
- **Percent of fertilizer samples not meeting guarantee** 20.5
- **No. of lime material samples procured and analyzed** 299
- **Total number of liming material samples not meeting guarantee** 4
- **Percent of liming material samples deficient** 1.3
- **Total number individual deficiencies in liming material samples** 4
- **Number of irregularities other than underweight** 2
- **Weight irregularities** 1
- **Fines collected, payable to State treasurer** $ 300.00
- **Penalties collected, payable to State treasurer** $ 20,642.79
  (Deficiencies where consumers not identifiable)

* This is a first report. Final report may vary slightly.
Fertilizer registration fees collected, payable to State treasurer** ........................................... 12,076.00
Lime registration fees collected, payable to State treasurer** ...................................................... 840.00
Soil amendment registration fees .................................................................
Lime permit fees collected, payable to State treasurer ......................................................... 2,850.00
Fertilizer taxes turned over to State treasurer ........................................... 181,811.27
Total monies sent to State treasurer ........................................................ 218,520.06

Fertilizer Movement in 1984-85
The fertilizer tonnage sold in 1984-85 was about the same as in 1983-84. After a very dry fall and poor soybean yields in 1984, fertilizer demand was low during the fall and winter months resulting in a 18.5 percent decrease for the July-December period. Demand was also low in January and February. But demand was heavy in March and April, and fertilizer movement was up 41.9 percent over the previous year. The heavy spring demand brought the year’s total to 693,652 tons* which was close to the 701,822 tons reported in 1983-84.

Fertilizer and Agricultural Liming Material Quality Control
Even with an outbreak of deficiencies during the very heavy March fertilizer demand, the 1984-85 quality was not very different from 1983-84 which was the best year since 1976. Of 6,302° samples taken, 1,251* or 20.5 percent did not meet the guarantees within the investiga­tional allowances.

Though a few plants had bad records, the fertilizer industry as a whole continued to make a concerted effort to make acceptable quality fertilizer.

Of 299° liming material samples taken, four did not meet the guarantees. The greatest problem with agricultural liming material quality control continues to be lack of proper labeling.

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* This is a first report. Final report may vary slightly.
** Actually recorded by State treasurer July 1, 1984-June 30, 1985 but may not correspond to final fees paid for the fiscal year.
LIVESTOCK-POULTRY HEALTH DIVISION

C. E. Boyd, Director

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

The division’s three main areas of responsibility are the administration of the South Carolina Meat and Poultry Inspection Programs, the Livestock Regulatory Programs, and the Diagnostic Laboratory.

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

Following are highlights of this division during 1984-85:

Meat and Poultry Inspection

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

There are 113 meat and poultry plants under State inspection. The full-time staff is six veterinarians, 55 inspectors, a compliance/evaluation officer and two administrative personnel. More than 100 million pounds of red meat and poultry are inspected annually in State plants. The State’s programs continue to meet standards that classify it as equal to the federal Meat and Poultry Inspection Program.

Cooperative Disease Eradication Programs

National disease eradication programs have been established in this country to eradicate certain national livestock diseases that cause great economic loss to the livestock industry. Our major programs are aimed at the eradication of brucellosis and tuberculosis in cattle and pseudorabies in swine.

During the year, the USDA approved the shipment of three stallions and seven mares under quarantine in South Carolina for intensive testing. These horses came from West Germany where contagious equine metritis exists. All were found to be free of the disease and were released from quarantine.

Animal Diagnostic Laboratory

The laboratory is staffed by six veterinarians and 11 technicians. It provides diagnostic services in animal pathology, bacteriology, virology and serology for the regulatory programs as well as diagnostic help to
practicing veterinarians and livestock and poultry owners in the State. During the year, the laboratory handled more than 3,000 cases and conducted more than 200,000 laboratory tests and examinations.

**Livestock Auction Market Inspection**

All livestock going through auction markets are inspected for contagious and infectious diseases. Around 100 livestock auction sales are held each month at the 20 livestock markets in the State. This division furnishes a veterinarian and livestock inspector at each sale to ensure compliance with all animal health requirements. In addition, a veterinarian is present at all dispersal and consignment sales for cattle and swine.

Three permits were issued during the year to operate new auction markets. One market discontinued operation.