Annual Report
81-82
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* Term began February 6, 1982.
** Term expired February 5, 1982.
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CLEMSON UNIVERSITY
THE CHALLENGE OF SERVING SOUTH CAROLINA
AND ITS CITIZENS

The 600-acre campus of South Carolina's land-grant university sits among the foothills of the state's northwestern corner. But Clemson University's teaching, research and public service activities reach far beyond the Piedmont. Through its nine colleges and graduate schools, Cooperative Extension Service, S.C. Agricultural Experiment Station, and regulatory divisions, Clemson provides a unique combination of programs for South Carolinians in every county of the state.

In 1981-82 Clemson's total enrollment was 11,861. The freshman class was 2,281 strong, and 2,387 degrees were awarded. Of those, 510 were master's degrees; 33 were doctorates. The University offered 81 undergraduate and 59 graduate programs of study in the colleges of Agricultural Sciences, Architecture, Commerce and Industry, Education, Engineering, Forest and Recreation Resources, Liberal Arts, Nursing, and Sciences.

Away from campus, Clemson operated 46 county Extension offices and five regional Experiment Stations. Additionally, the University continued to perform inspection and certifications to ensure the quality of seed, livestock, poultry, fertilizer, and pesticides sold in South Carolina.

Faced with severe funding limitations and rising prices, Clemson has strengthened its commitment to innovation and careful management of resources to fulfill the University's service mission. That commitment is evident in a number of significant events that happened in 1981-82.

For example, in August 1891 Clemson completed a year-long self-study, required once each decade as part of the Southern Association of Colleges and Schools' accreditation review process. The thousand-page summary addresses "key issues with a focus on the future" and finds Clemson entering that future with "confidence and optimism."

Later in the year, a special University committee began a comprehensive review of all academic programs, beginning at the graduate level. The Academic Planning Committee's study will help refine Clemson's academic priorities and identify the school's "centers of excellence."

U. S. Sen. Strom Thurmond announced Oct. 29 plans to give to Clemson his public papers and memorabilia. Simultaneously, Clemson President Bill Atchley revealed that the Thurmond collection will serve as the nucleus of The Strom Thurmond Center for Excellence in Government and Public Service, a complex of new facilities including a major auditorium and a continuing education building. Private funds are being raised to build the center.

The second half of the fiscal year began with the naming of Robert D. Tollison as Clemson's first Abney Professor of Free Enterprise. The endowed professorship, established in the economics department in
March of 1981, is the result of a $1 million gift from the Abney Foundation.

E. J. Middlebrooks was tapped in February 1982 for Clemson's first endowed chair, the Charles Carter Newman Professorship in Natural Resources Engineering. The endowment was established by J. Wilson Newman, retired president and board chairman of Dun and Bradstreet, in honor of his father.

As the fiscal year drew to a close, 20 months of work on a comprehensive master plan for the Clemson campus was also reaching a conclusion. The summary report presents a "framework" for the development of the campus in accordance with changing needs and resources.

Throughout the year, the University made important strides in its development as a major research institution. These include start-up of the Engineering Center for Automated Manufacturing Technology and the Energy Research and Development Center; announcement of plans for the Clemson Industrial Research Authority, a private, non-profit corporation that will work with the state in developing an industry-oriented research park near the campus; and addition of a $1,000 stipend from the Clemson Alumni National Council to the Outstanding Research Scientist Award given annually by the local chapter of Sigma Xi, an national research fraternity.

Clemson also distinguished itself in athletics in 1981-82, ending the year with the national championship in football, six Atlantic Coast Conference titles, nine Top-20 teams, 60 All-ACC athletes, 26 All-Americans, and four national coaches-of-the-year. The No. 1 ranking in football followed a 12-0 season capped by a 22-15 defeat of Nebraska in the Orange Bowl Jan. 1.

In retrospect, then, 1981-82 was a successful year for Clemson, one during which the University not only met the challenges of the present, but also prepared for an even more challenging future. It is in that spirit that Clemson is getting ready to launch a multimillion-dollar capital campaign, the "Challenge to Greatness," in 1983.
ACADEMICS 1981-1982

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
Harlan E. McClure, Dean

College of Commerce and Industry
Ryan C. Amacher, Dean

College of Education
Harold F. Landrith, 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

The mandate of Thomas Green Clemson in establishing this institution, “to afford through instruction in agriculture and the natural sciences connected therewith,” continues to serve as the guiding principle for curricula and instructional activities in the College of Agricultural Sciences.

Agriculture remains a dynamic field of critical importance to humankind. Overall, it is a broad area of rapidly increasing complexities. The need and challenges to produce more food and to reduce losses from pests and spoilage have never been greater. In meeting these challenges, a variety of issues must be addressed, including environmental concerns.

Pollution from the use of a variety of agricultural chemicals (pesticide and fertilizers) is a popular concern, but soil erosion is the nation’s leading conservation problem, although this issue is not widely recognized outside of agriculture. Of course, agriculture is concerned with, and potentially affected by, all forms of pollution. Economic pressures have grown to a critical level; relief is essential. At the same time, agricultural exports represent the brightest aspect of our national balance of payments. Agriculture is deeply affected by availability and cost of energy, labor supply, and by adverse climatic conditions which recently have devastated various crops throughout the US (including, for example, the loss of peaches in South Carolina as a result of severe 1982 spring freezes.)

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

To meet the mission of the College of Agricultural Sciences in instruction:

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

Curriculum revision is an ongoing process at both the undergraduate and graduate levels. The importance of practical experience for students is widely recognized; the pattern of our student body is well established
and consistent with national trends: 30 to 40 percent women, with more than 50 percent of the total student body claiming "nonfarm" backgrounds. As a result, the recently initiated internship programs have grown markedly; in 1981-82 the number of students placed as interns (or in a practicum setting) increased more than four-fold from 1980-81. Most are in summer programs.

In addition, the newly (1980-81) opened microcomputer facility has proved to be enormously successful; many courses have been modified to include exposures to this emerging field of agron-technology. Plans include the development of at least one course to serve all agricultural students in the area of microcomputer applications to problems in agriculture. The emphasis of our efforts is interfacing microcomputers with agricultural systems, equipment, and problems, not computer theory or "main frame" use. The facilities and expertise of the college are in demand by other colleges and by off-campus groups.

Enrollment has declined to below 900. Although this decline parallels national trends, it is of concern because the demand and documented need for agricultural graduates continues to increase. The college has initiated a multifaceted program to inform qualified high school students, their parents and guidance counselors about career opportunities in agriculture and educational opportunities in agriculture at Clemson. Currently, emphasis is placed on the major agricultural producing areas of the state.

The total foreign agricultural efforts and programs of the College have expanded. In addition to 3 contract programs through SECID, during 1981-82, 21 foreign students were enrolled in degree programs in agriculture at Clemson and more than 50 foreign visitors were hosted in agriculture for visits ranging from a single day to a full year.

Agricultural Technology Program

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

Twelve two-year programs and a single one-year certificate program are offered at eight state technical colleges. Enrollment in these programs was 403 in 1981-82; 106 students graduated. Some programs may have to be cut, but recruiting efforts are being intensified. Demand for graduates remains good to excellent. A new program in forest products has been initiated at the Orangeburg-Calhoun Technical Education Center.

Continuing Education

Agricultural scientists, teachers, producers and agribusiness professionals in all fields need help to keep pace with the rapid changes in
agriculture. They are all interested in various types of in-service training programs, as well as conferences, workshops, seminars and professional meetings. Continuing education activities sponsored by the College of Agricultural Sciences served personnel in the Cooperative Extension Service, various types of agricultural technicians, vocational agriculture teachers and veterinarians. Continuing education credit was granted for numerous programs, and more than 300 individuals received Continuing Education Units for one or more programs. Finally, a wide variety of visitors tour facilities at Clemson and research locations throughout the State. Most students and prospective students visit in the late spring and/or summer.
“Courage” is that extra quality which must be added to those faculty requisites of talent, knowledge and motivation to prepare for years such as those recently completed. In an academic sense, 1981-82 was a successful year, but greatly frustrated by inadequate administrative latitude and diminishing funding. The College of Architecture has been generally recognized in national professional circles as having high quality professional programs in architecture, building science and management, planning and environmental arts. Thus, the degree offerings at both undergraduate and graduate levels have attracted far more qualified applicants than can be accommodated, and the number of those accepted has been predetermined annually by the faculty and college administration on the basis of space, equipment and faculty available. A recent New York Times study on higher education in South Carolina listed Clemson as one of the three top quality institutions and recommended the offerings of the College of Architecture as one of three areas at Clemson to be sought by students seeking collegiate excellence.

This seeming paradox can occur because despite the reduction in the budget of the college in terms of “real” money, steadfast faculty efforts have enabled high quality teaching coupled with public service to continue with selfless zeal and determination. The pressures for admission to the College of Architecture continue at all levels and must be met by longer hours of faculty interviews, counseling and screening. These efforts display unusual motivation despite lack of financial rewards, which have not yet dampened faculty morale, although it would be hazardous to continue this condition much longer.

During the fall of 1981, the College of Architecture was visited by a team representing the National Architectural Accrediting Board, the last visit having occurred just over five years earlier. The team thought it remarkable — considering the state of the economy — that so many of the school’s graduates were so readily absorbed into offices across the country. They attributed this to the strong past performance of graduates of the college as well as to the high evaluation of the school by the practicing profession. The accrediting team also considered unequalled the strong, constructive and mutually supportive relationships between the college and the profession it serves.

Speakers

The national executive vice president of the American Institute of Architects, David Meeker, FAIA, was the Honors Day speaker at the college ceremony on April 7th. Other notable speakers in the college series during 1981-82 included Sir Peter Shepheard, London, England; August Kommendant, New York City, NY; Warren Cox, FAIA, Washington, D. C.; Suzanne Blier, Northwestern University; James O’Gorman,
Wellesley College; Dean Harlan McClure, FAIA; Ben Evans, V.P.I.; Bruce Kriviskey, AICP, Milwaukee, WI; Evans Woollen, FAIA, Indianapolis, IN; and Peter Lee, Alumni Professor, Clemson.

During the Academic year 1981-82, an unusual cooperation was developed between the College of Architecture-Clemson Architectural Foundation Graduate Center in Genoa, Italy, the Municipality of Genoa, Italy, and the University of Genoa. Thus, a series of internationally famous architects were brought to the city for lectures, and each stayed for several days at the Clemson CAF Center. The series included Sir Dennis Lasdun, Professor Gian Carlo de Carlo, Professor Donlyn Lyndon, Peter Smithson, FRIBA, Gregor Gregotti, Charles Moore and Aldo Van Eyk.

Work in the State

Over the past 25 years, the College of Architecture has used the State of South Carolina as a laboratory for research and public service projects which have been the vehicles for creative “real world” instruction at undergraduate and especially graduate levels. During the past year, fifth-year architectural graduate students completed proposals for the revitalization of downtown St. Matthews, S. C. Another group studied the adaptive re-use of the old Sacred Heart Roman Catholic Church in Augusta, Ga. Both of these projects received a great deal of local interest and support. In another adaptive re-use study, fifth-year graduate students determined the feasibility of converting a former bank and a movie theater into a community arts center and legitimate theater for Beaufort, S. C. It will doubtless be done.

The health care facilities planning students of the college made a detailed series of alternative proposals for the expansion and upgrading of the Clarendon County Hospital in Manning, S. C. Preliminary steps were taken to begin a project to expand and update the Highlands-Cashiers Hospital in Highlands, N. C.

During 1981-82, the Department of Planning Studies developed a special focus on small communities and rural planning. Eight graduate assistantships were established in the department with funding by the communities served.

Publications

The following publications were written by members of the faculty of the Department of Planning Studies:


In addition, faculty were involved in the following items of note: Edward L. Falk, professor and head of planning studies, served as editor of the "Palmetto Planner" for the South Carolina American Planning Association Chapter, and on October 9, 1981, chaired a symposium on Resources for Economic Growth in S. C.

In May 1981, Barry C. Nocks, associate professor of planning studies, was awarded a research fellowship by the Gerontological Society of America (GSA). He has also continued public service activities with the Department of Health and Environmental Control (DHEC) and the S. C. Hospital Association.


**Lectures and Papers**

Members of the faculty of the College of Architecture were active in presenting lectures and papers during this past year, some of which are listed here:

Cecilia Voelker, associate professor, Department of History and Visual Arts, read a paper at the International Renaissance Conference, Tours, France, and lectured at Syracuse University on December 8, 1981, on "New and Old St. Peters, Rome";

Ralph Knowland, professor and head, Department of Building Science and Management, read a paper to the Construction Personnel Executive Association in Hilton Head, S. C., November 10, 1981;
M. David Egan, associate professor, Department of Building Science and Management, lectured at the Institute on Energy and Engineering Education, Ohio State University, March 8, 1982;

Harlan E. McClure, Dean, College of Architecture, addressed the Industrial Developers Association Convention at Myrtle Beach, S. C., April 28, 1982, and was a college lecturer at Williams College, Bristol, R. I., on March 18;

John T. Acorn, professor and head, Department of History and Visual Arts, lectured at the S. C. Art Education Conference in Spartanburg, S. C. He also gave a lecture in connection with his exhibit at the Greenville Art Museum, and he made a presentation to the Anderson County Art Association;

Joseph L. Young, professor, architectural studies, was advanced to Fellowship in the American Institute of Architects for outstanding services to architectural education. Professor Young, Recorder, and Dean Harlan McClure, Grand Chapter Master of Tau Sigma Delta — International Honor Fraternity for Architecture and Allied Arts — conducted the annual meetings of that body in Quebec, Canada;

Martin Davis, associate professor, Department of Architectural Studies, presented a paper, “Humidity Fluctuations in Solar Greenhouse Residences” at the sixth National Passive Solar Conference in Portland, Ore. He also spoke at the ACSA Regional Conference on “Teaching Passive Solar Design in Architecture Evaluation”;

Dr. Johannes Holtschneider, professor, architectural studies, published “de Holzhaeuser des Norman Jaffee”;

Yuji Kishimoto, associate professor, architectural studies, presented a second annual Japanese film series open to the University, and wrote an article in Japan Architect, “Architectural Education in the United States”;

Gayland Witherspoon, professor, architectural studies, published a joint research report with Rudolf Elling, civil engineering, entitled “South Carolina Highway Metal Truss Bridge Survey.” He has been appointed a member of the National U. S. Air Force Design Awards Committee. The Witherspoons also had their house featured in Southern Living;

George C. Means, professor, architectural studies, serves on the National AIA Committee on Architecture for Health.

Special Honors

The following members of the faculty received special honors during 1981-82: Samual Wang, professor, visual arts, had work selected for the permanent collection of the Metropolitan Museum of Art, New York City, N. Y.; Tom Dimond, assistant professor, visual arts, was selected for the Five Printmakers Exhibit at the Southern Center for Contemporary Art, Winston-Salem, N. C.; Sydney Cross, assistant professor, visual arts, exhibited graphic work at the Greenville Art Museum, Greenville, S. C.;
Mark Hudson, assistant professor, visual arts, has studio work in drawing and painting in a traveling exhibit throughout South Carolina; Robert Hunter, professor, visual arts, had a one-man Exhibition at Anderson Art Center, Pickens County Art Center, and McDonald Gallery, Charlotte, N. C.; Ireland Regnier, professor, visual arts, had a traveling exhibition in Schools of South Carolina and exhibited at the Tatler Gallery, Hilton Head, S. C.; Janet Mulholland, assistant professor, visual arts, has been selected by McGraw-Hill to review books on the visual arts; Michael Vatalaro, assistant professor, visual arts, was elected to the board of the Southern Association of Sculptors and was in exhibitions of Southeast Ceramics, Athens, Ga., and Reedy River Crafts Invitational, Rock Hill, S. C.

Annual Study-Tour

The fourth Clemson Architectural Foundation Study-Tour for college alumni and other practitioners in architecture, landscape architecture, city planning and building construction was held in May and June, 1982. Studies included sites, buildings and gardens in Paris, Burgundy, Switzerland and Italy. The nucleus of the Italian portion of the trip was formed in Venice and Veneto with intensive tours to villas and other buildings designed by the distinguished 16th Century architect, Andrea Palladio. A special sequence of events at the Genoa Center over a period of several days drew the Study-Tour to a fitting conclusion.

Also in Italy, preliminary conferences were held in June 1982 with colleagues at the University of Genoa relative to establishing joint funded research efforts with the Clemson College of Architecture CAF Daniel Center. A sequence of community urban design studies of Ligurian towns is planned. It is anticipated that the first of these projects will be funded and underway by the summer of 1983.

Faculty Retreat

The fifth annual retreat of the faculty of the College of Architecture was held on January 22, 23 and 24, 1982, at Hickory Knob State Park. Dr. Bruce Yandle, presently the executive director of the Federal Trade Commission, presented the keynote address entitled, “Economic Cycles and Their Effect on the Building Industry.” Possible revisions or expansion of the curricula to develop graduates with optimal skills in the economic and managerial aspects of the industry were discussed. College faculty participated with enthusiasm, and recommendations were made for the use of appropriate college committees to help students be better prepared to deal with the rapid changes in the practicing profession.

In this retreat, as in the various programs of the College, leadership and excellence are the keys to prime administrative and faculty concerns. Both the economic means and administrative flexibility are needed to maintain and improve present excellence.
COLLEGE OF COMMERCE AND INDUSTRY

Reorganization of the College of Commerce and Industry (formerly the College of Industrial Management and Textile Science) came in 1981-82. This reorganization created three schools within the college: the School of Accountancy, the School of Business and the School of Textiles. The Office of Professional Development and the Small Business Development Center remain as separate entities reporting directly to the dean.

The School of Accountancy concept is a recent and popular trend in accounting education. It should enable the college to attract financial support from public accounting institutions since it increases the visibility of the accounting program. The School of Textiles gives special attention to the textile programs, yet keeps them in the college framework while providing a unique opportunity to integrate the business component into the textile industry. It also facilitates the development of a program in textile management. The School of Business houses the traditional business components including the departments of Economics, Finance, Marketing and Management. These changes identify the college departments more specifically.

Two visitation teams came during the year: the first was from the American Assembly of Collegiate Schools of Business, and was the culmination of the previous year’s self-study for continuing accreditation; the second was made on behalf of the South Carolina Commission on Higher Education.

The college continues to grow in numbers of students majoring in its 14 curricula. In fall 1981, 2,652 — more than one-fourth of Clemson’s undergraduates — were enrolled. The graduate programs include 91 master’s and Ph. D. students. The Clemson-Furman MBA program enrolled 187 students.

The total perspective of the college is best shown through descriptions of its major components.

School of Accountancy

On January 1, 1982, the Department of Accounting and Finance was split into the School of Accountancy and the Department of Finance. Dr. James R. Davis, former accounting and finance head, was named director of the new school.

Student demand has been strong in this area’s degree programs and service courses. Accounting majors increased by 5 percent to 381, while finance majors increased by 6 percent to 571. Once again, over 2,500 students registered for accounting and finance courses each semester. Summer school offerings also reached record numbers when seven new classes were added.

With the retirement of the former department head and the addition of five new faculty members, the accounting faculty has a new and different
composition. A substantial increase in research activity is currently under way, and the accounting faculty is at its highest level of service and professional development activities. Service contracts with other State agencies exceeded $40,000 in 1981-82.

The School of Accountancy began a fund-raising drive during the year to support the proposed five-year Master of Accountancy program. Although the program has not yet been approved, the fund-raising efforts have been very successful. It is expected that the new graduate program will be approved during the coming year.

Other activities and events during the year included the annual recruiters’ picnic, the first annual homecoming brunch and the first edition of "The Clemson Ledger," the school’s newsletter. Several new scholarships and awards were added during the year, and accounting students received a record number of honors and awards on Honors and Awards Day.

School of Business

Department of Economics

The 1981-82 academic year was another very productive year in the Department of Economics. The faculty continued to provide a high quality education for the students in the college and public service to the citizens of South Carolina.

After five years of rapid growth, enrollment in economics courses has stabilized. Consequently the department is now in a state of transition, mainly identifiable by an expansion of the number of upper division and graduate courses offered.

An important milestone in scholarly research was reached this year. In only four years the department has become the number-one ranked economics department in the South among those offering only a master’s degree. Such rapid development is attributed to the high quality faculty and their total commitment to scholarship.

This year’s research includes six scholarly books, five monographs, three completed research grants, 50 articles in refereed professional journals, 25 papers presented at professional meetings, numerous pamphlets, six book reviews and several contributions to books.

However, the research does not stop there. More than 40 articles are under review in professional journals, and ongoing research is being conducted in a wide variety of research areas. Not only has the faculty been productive, but one of our secretaries had an article published in a professional economics journal.

As a result of scholarly endeavors, the faculty were interviewed by newspapers and radio and television stations. Richard McKenzie is on sabbatical as senior research economist at the Heritage Foundation during the fall semester 1982. Bruce Yandle has taken a two-year leave of

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absence to become the executive director of the Federal Trade Commission. Both individuals have brought much national recognition to the department.

The Southern Economic Association chose Richard McKenzie to serve on the editorial board of the *Southern Economic Journal*. Hugh Macau­ley was elected by his fellow economists to serve as executive officer in the Southern Economic Association. Such recognition marks another milestone for the faculty.

The department completed its eleventh year of weekly newspaper columns to more than 30 newspapers in the South. In the 1981-82 academic year more than 200 columns were written by faculty members and appeared in newspapers throughout the United States. Columns appeared in such distinguished newspapers as *The New York Times*, *Wall Street Journal*, *Christian Science Monitor*, and *Reason* magazine.

After an extensive search, Robert Tollison was selected to be the first holder of the Abney Chair of Free Enterprise. Professor Tollison has served as the director of the Public Choice Center at Virginia Polytechnic Institute and State University and is currently the director of the Bureau of Economics at the Federal Trade Commission. He is a nationally acclaimed scholar and has published more than 90 articles and nine books on various economic issues. He brings to the department an eagerness to excel, a willingness to work with colleagues and a proven record of accomplishments. The department is grateful to the Abney Foundation for making such a faculty addition possible.

The department continued its extensive public service programs to the citizens of South Carolina by giving more than 100 speeches on various economic topics to civic clubs and professional organizations. The Center for Economic Education continued to provide graduate economic courses, workshops, and in-service training programs for public school teachers and published a quarterly newsletter to help teachers instruct students about economics. These efforts continue to improve the economic literacy among high school students in South Carolina.

The future prospects for the department look even brighter since four highly qualified faculty members will be joining the department in the upcoming year. Among the new professors will be a nationally famous applied microeconomist, a researcher in market solutions to environmental problems and an economic theorist. Also, G. Richard Thompson will be joining the faculty as well as serving as the new assistant dean of the college. The department looks ahead to a continued improvement of its already excellent record of scholarship, instruction and public service.

**Department of Finance**

During the year, the finance faculty added one new member. Research and service continued strong in the area with several articles published in leading professional journals.
Professional service also grew as the faculty shared its new computerized financial planning model with local government agencies. They also greatly expanded the student use of computer applications with the new model. The finance faculty excelled in the classroom and with student rapport.

**Department of Management**

During the past year the Department of Industrial Management was renamed the Department of Management. The new name more clearly defines the primary functions of the department. The Administrative Management degree is the largest in number of majors. The department continues to offer a B.S. degree in industrial management, M.S. in management, Ph.D. in engineering management and a Ph.D. in management science.

The degree programs were evaluated by three groups in 1981-82. In January, the South Carolina Commission on Higher Education reviewed each program from "Standard Information" forms provided by the State. The University Academic Planning Committee reviewed the department's two Ph.D. programs as well as all other Ph.D. programs offered at the University. The M.S. program in management was evaluated for AACSB accreditation and the administrative management and industrial management curricula were evaluated for reaccreditation at the same time.

The department continues to emphasize maintaining high quality programs and providing excellent teaching. Although excellence in teaching is a primary objective, research, consulting and public service also continue to be important goals. The addition of four new faculty members this year further enhances the quality of teaching and publishing the department strives to maintain.

Enrollment in the six degree programs administered by the department continues at about the same level, with some increase in the undergraduate programs.

**Number of majors by categories:**

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate</td>
<td>1,336</td>
</tr>
<tr>
<td>Graduate Resident</td>
<td>45</td>
</tr>
<tr>
<td>Clemson/Furman MBA*</td>
<td>176</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,557</strong></td>
</tr>
</tbody>
</table>

**Degrees Awarded by Type**

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor of Science</td>
<td>278</td>
</tr>
<tr>
<td>Master of Science</td>
<td>12</td>
</tr>
<tr>
<td>Master of Business Administration*</td>
<td>30</td>
</tr>
<tr>
<td>Doctor of Philosophy</td>
<td>3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>323</strong></td>
</tr>
</tbody>
</table>

* Taught and administered at Furman University.
Management graduates are highly recruited by both regional and national firms. A large number find employment in production and marketing. However, they are by no means limited to these since they are also prepared to work in areas such as personnel, labor relations and finance. The nature of the industries which recruit our graduates and the opportunities available to graduates in management are diverse.

The department assists the University Placement Office in arranging interviewing sessions with companies specifically interested in management graduates. A résumé booklet is prepared each year in an attempt to provide graduates with as much exposure to employment opportunities as possible.

**Department of Marketing**

In January 1982 the Department of Marketing was created as a separate department within the college. Gerald L. Waddle will act as head until a search for a new head is completed.

**School of Textiles**

While experiencing a period of stabilization with newly renovated facilities, textile activities during the past year have focused on expanding the scope of teaching, research and service functions. The addition of an academic liaison position (through non-state funding) has resulted in positive communication statewide regarding the value of textile education. Consequently, more interest has been shown in the undergraduate curricula, and freshman enrollment in textiles has doubled.

In addition, an increased number of transfers in concert with leaders of the South Carolina textile industry and Clemson textile alumni proposed a new academic program designed to provide 21st century leadership for the State’s principal industrial base. The proposed plan of study, entitled “Textile Management,” works under the philosophy of being responsive to the needs of the textile industry and providing the student with the opportunity to become an integral part of the industry’s future in South Carolina.

Textile research work has been expanded through graduate thesis and dissertation progress, as well as increased extramurally-sponsored projects. The textile structure at Clemson has been chosen as the model for a center of textile excellence in Covilha, Portugal. Through the auspices of the Agency for International Development, research funding has been granted for faculty exchange and training there.

The nonwoven fabric capabilities are presently being contractually supported by the U.S. Army Natick Laboratories on two projects to develop materials for chemical protective clothing. Other sponsored research underway involves National Science Foundation work on student awareness, National Bureau of Standards work on flammability, USDA work on cotton fiber quality evaluation, and private sector work on
space shuttle fabric, nonwoven composites, cotton dust, warp sizing technology, weathering analyses and fiber processing.

As part of the school’s broadening scope, a comprehensive textile advisory structure has been organized and implemented. The resulting textile advisory matrix encompasses five key elements central to the textile industry: providers of textile materials and manufacturing means, including fibers, chemicals and machinery; producers of yarns; producers of fabric; dyers, printers and finishers; and providers of enterprises that convert textile materials to consumer goods, including apparel, home furnishings and industrial specialities. The textile advisory body is presently chaired by the college’s industrialist in residence and is intended to assist the faculty in matters involving textile education, student interaction with industry, research, service and facilities. This expansion has already resulted in more involvement with and direct service to the textile and related industries. The School of Textiles looks to the future optimistically with its principal goal intact of having at Clemson a textile school that is recognized as the focal point of world excellence.

Professional Development

During 1981-82, 5,456 women and men representing more than 1,000 different companies enrolled in 150 professional development courses. Thirty-seven percent of the participants in these programs came from South Carolina, 16 percent from North Carolina, eight percent from Georgia, two percent from Virginia and one percent from New York.

Programs which received the highest attendance were Theory Z, The Economic Outlook Conference, Professional Development for Women, Communications: The Key to Effective Leadership, and Accounting for School Food Service. The companies or organizations most highly represented were J. E. Sirrine Company, Clemson University, E. I. duPont, Milliken, J. P. Stevens and Burlington Industries.

The professional development activities presented can be divided into five major categories:

- The Executive Briefing Series
- The One-Day Management Series
- The Textile Conference
- The Productivity Improvement Series
- The In-Plant Programs.

Each of these specific programs is described below.

The Executive Briefing Series

The Executive Briefing Series brings top management thinkers and innovators to the upstate for intensive one-day programs on topics at the cutting edge of tomorrow’s business and industrial thinking. EBS began in December 1981 with William Ouchi’s first presentation of Theory Z at
Clemson. Since then, Ouchi has returned for a second briefing in Greenville. Charles Garfield, president of the Peak Performance Center in Berkeley, California and a member of the University of California Medical School faculty, presented a briefing, "High Performance Management." Several new briefings are in the works.

One Day Management Series

Professional development’s new one-day management seminar series represents a major outreach program, carrying 12 seminars into 22 Southeastern cities for 122 separate events. These programs, designed for the busy manager, will provide intensive treatment of specific topics and will be held within a day’s drive of virtually everyone in the Southeast. With this series, professional development takes top-quality professional continuing education TO those whom we serve, from South Carolina to Florida to Arkansas.

Textile Conferences

Professional Development textile conferences continue to expand in scope and variety of offerings. In 1982, nine completely new textile conferences were offered on topics ranging from "Automation" to "Uniforms" to "Warp Knitting" to "Cotton Dust Control." Enrollment in overall textile offerings also grew by more than 73 percent last year despite the recession. With the addition of a new textile program development specialist, Jud Hair, Jr., professional development is now planning additional new programs in textile sales, factoring and apparel.

The Productivity Improvement Series

Few management topics have received as much attention as "Productivity Improvement," and professional development has been at the forefront of the issue. Offerings for 1982 included two wide-ranging conferences on productivity improvement methodologies, systems and strategies, three executive briefings on "Theory Z," six "Quality Circles" programs and a conference on "Japanese Management." Also, a number of the other programs were revised and re-oriented toward productivity and quality improvement, reflecting the concerns and needs of the college’s industrial clients.

The In-Plant Programs

During fiscal 1981-82, the Office of Professional Development conducted 27 in-house training programs. These seminars and workshops extended into Kentucky, Virginia, Tennessee and North Carolina. The variety of organizations reached include government, military/civilian, engineering, medical, public service, textiles/chemistry and retail.

Faculty for these training programs were drawn not only from Clemson University, but also were well-known national lecturers. The quality
of the programs presented is demonstrated and reinforced by the requests from companies for follow-up training.

Knowledge of new developments, technology and management theories can be obtained through various means. However, as this report indicates, participation in professional development programs away from the office has proven to be one of the most successful of all methods offered for learning.

The presentation of authoritative, up-to-date information with immediate benefits is one reason for the 1981-82 success story. Another is the opportunity for attendees to exchange ideas and information with a national cross-section of peers.

Small Business Development Center

The Small Business Development Center of South Carolina is a consortium of four universities in the State. During the year, the regional center at Clemson conducted 30 continuing education courses attended by nearly 1,000 small-business persons. Each course addressed the basic needs of small businesses such as accounting and payroll procedures, inventory control, cost reduction and computer management. In addition, more than 230 clients used the consulting services offered by the center. These services included market research, business startups, initiating record keeping processes and general management advice. Research and consulting for small-business persons was handled by graduate students and faculty members from the College of Commerce and Industry.

A "satellite" center was also opened in Spartanburg during the year. Although the "satellite" is located on the University of South Carolina at Spartanburg campus, it is part of Clemson's regional center. With demand for SBDC services increasing in the Greenville/Spartanburg area, it was necessary to place a full-time consultant in this part of the upstate. Consultants from the Clemson-based center are now free to spend more time in other counties.
The move into the newly renovated Tillman Hall was completed during the year. The Dean's Office, the departments of Aerospace Studies, Agricultural Education, Elementary and Secondary Education, the offices of Doctoral Studies and Educational Services and Placement, and the college's Instructional Materials Center are housed in Tillman. Long-range planning to relocate the Department of Industrial Education in Godfrey Hall was completed during 1981-82, and the first phase of the Godfrey renovation project is scheduled to be completed by December 1982. After initial renovation, the lower level of Godfrey Hall will house laboratories and arts and crafts, power technology and plastics.

Plans for the first and second floors of Godfrey Hall have been completed by a building committee, and the project has been designed by the University Physical Plant engineers. This project is an especially cost-effective undertaking since it will place an inactive academic building back into active service. It will also return badly needed space now occupied by the Industrial Education Department to the College of Engineering.

The Department of Military Science is temporarily located in mobile units near Alumni Park while their permanent headquarters in Johnstone are being renovated. That work is expected to be completed by fall of 1982.

Degree Programs

Two new degree programs were approved by the Commission on Higher Education during the 1981-82 academic year. The M.Ed. in special education with certification options in educable and trainable mentally handicapped, learning disabled and emotionally handicapped was implemented in January 1982 and is administered by the Department of Elementary and Secondary Education. A new bachelor's degree program in graphic communication will be implemented in August 1982, and will be administered by the Department of Industrial Education. This new program resulted from the need expressed by the printing industries in South Carolina. The curriculum is designed to prepare students for careers in printing management, graphic arts sales and printing production.

The College of Education is scheduled for a visit from the National Council for Accreditation of Teacher Education in March 1983. Preliminary plans for the visit, including procedures for the preparation of the report, were worked on during the year and are well under way.

The Doctor of Education program in vocational and technical education admitted its first students for the fall of 1981 semester. This program focuses on the preparation of graduates for leadership roles in the broad field of vocational and technical education in the State and region.
Graduates will assume positions in the public schools, technical colleges, state agencies, industries, and colleges and universities.

The college is comprised of the departments of Aerospace Studies, Agricultural Education, Elementary and Secondary Education, Industrial Education, Military Science, and the Offices of Doctoral Studies and Educational Services and Placement. The college offers 23 undergraduate and 13 master's, one educational specialist, and one doctoral degree program. Ninety-two percent of the teacher education faculty hold doctoral degrees.

**Instruction and Teaching**

The College of Education has continued a laboratory-centered approach to preparing education personnel. The Department of Elementary and Secondary Education placed approximately 1,600 teachers during 1981-82. These placements range from full-day, twelve-week student teaching to the tutoring of individual children.

To be in compliance with the recently passed South Carolina Act 187, the Department of Elementary and Secondary Education implemented a major curriculum revision during the past year. The old program will be completely phased out this year, and the new program is in place and operating.

Curriculum development activities of the agricultural education and industrial education faculties ranged from preparation of new and innovative course syllabi for the doctoral program to increase and improve leadership in vocational/technical education, to adding extension education courses to departmental offerings. Innovative procedures in the instructional program included an increased use of computers, microcomputers and audio-visual equipment.

Total student enrollment for ROTC programs for academic year 1981-82 increased approximately 20 percent with 52 young men and women being commissioned as Army and Air Force lieutenants.

**In-Service**

The college provided both credit and non-credit in-service and staff development programs to professional educators. The college faculty taught 102 off-campus courses for university credit at 24 different locations and enrolled more than 1,400 teachers who were upgrading their professional skills. Cooperating colleges — Lander and Presbyterian — taught courses for teachers who received graduate credit at Clemson.

Agricultural education faculty taught five graduate courses at off-campus locations in important South Carolina agricultural areas. Total enrollment was 57. At minimum cost these courses helped vocational agriculture teachers and extension agents upgrade their professional skills.
Research and Grants

The Department of Agricultural Education continued to assist agricultural departments in program evaluation through a Standardized Achievement Testing program designed to measure the abilities of students enrolled in off-farm occupation courses. This service provided standardized pre-tests and post-tests for agricultural mechanics, ornamental horticulture, forestry, and pulpwood harvesting. It also developed or revised standardized tests in turf and lawn management, sales and services, and other areas as the need arose.

During 1981-82 the recently revised horticulture test for first year students and the new horticulture test for second year students were administered to collect additional data for performing item analyses and developing more reliable norms. Usually these tests are administered as pre- and post-tests by the vocational agriculture teachers, and the answer sheets are returned to Clemson for scoring and interpretation. Each teacher can receive feedback on students' progress from fall to spring and can compare the performance of the students and school with others throughout the State. Almost 1,000 students were tested this year.

Computer software was developed to complement the graphic arts curriculum by the PICA project. One program uses the computer to make a test and another program provides for quick scoring of tests. Both are scheduled to be field tested during the fall of 1982.

Special Activities and Services

As mandated by State legislation, agricultural educators from Clemson University participated with a State Department of Education team in reviewing and evaluating 34 local vocational agriculture programs. These evaluations pointed out specific strengths and weaknesses of each program and determined if year-round employment of the teacher could be justified.

The Department of Agricultural Education sponsored the 55th annual Future Farmers of America State Convention in June 1982. During the convention 262 high school students participated as chapter delegates, award winners and contestants. State FFA contests, leadership activities and award presentations were scheduled throughout the convention. All contest winners will face higher competition at the tri-state, regional and national levels.

The Department of Elementary and Secondary Education hosted the annual Clemson Reading Conference on the Clemson campus. More than 1,000 people attended, and nationally known scholars participated in the various meetings.

Faculty members from the Department of Elementary and Secondary Education continued their heavy schedule of service work with public schools. Staff development activities for teachers, administrators, and
non-professional workers, accreditation activities, consulting on research and evaluation projects and public relations appearances were some of their activities.

The industrial education faculty were active in public service throughout South Carolina last year. Some of the most significant activities included in-service education for vocational teachers, industrial arts teachers and vocational administrators.

In Air Force ROTC, the Inspector General's visit gave the Department of Aerospace Studies an excellent rating and was enthusiastic about support from the University and the community. At the 35th anniversary of Air Force ROTC, the governor proclaimed September 19, 1981 Clemson Air Force ROTC Day in South Carolina. The deputy assistant of the Air Force honored Clemson for its support of ROTC programs, and many aerospace student organizations gained recognition for their service projects. Colonel L. E. Jordan, professor of aerospace studies, was chosen the nation's most outstanding area adviser for Arnold Air Society.

Some 28 schools participated in the 10th Annual Tiger Drill Meet, co-sponsored by the Departments of Aerospace and Military Science.

The Military Science Department hosted the Army Golden Knight Parachute Team and a team of army officers from the Army War College who taught classes in several departments throughout the University. The department also represented Clemson University in national drill events, co-hosted a military ball and participated in several rifle matches.

Faculty devoted many hours aiding the South Carolina Department of Education and the Educator Improvement Task Force, and participating in other public service activities ranging from test development and professional consulting, to committee involvement. Faculty also helped implement South Carolina Act 187.
The College of Engineering is the primary source of engineering education for South Carolina and provides technological leadership in several ways: (1) college faculty are a resource to State government for advice and counsel, and in the recruitment of high-technology industry; (2) college faculty are an accessible engineering resource base to conduct research and solve problems for industry; and (3) college graduates strengthen State industry through the infusion of new talents and ideas.

The demands and opportunities for innovative research and development over the next two decades are almost unlimited. Technological change will necessitate an extensive reworking of the world in which we live: the development of low cost, small, highly reliable microprocessors; the inevitable restraints and increased costs of limited resources — increased consumer concern with "quality of life"; and the aggressive competition of new world markets for technology. To adapt our world to these new opportunities and new limits will require a level of sophistication and technological development that exceeds anything we have seen to date.

The Clemson University College of Engineering welcomes the chance to contribute to the solutions of these problems. The demand by industry for Clemson graduates, the demand for faculty to do research, and the demand for technology transfer, through continuing engineering education and consulting, places the college in a particularly attractive position to provide the key technological leadership for South Carolina. This leadership has been enhanced by the selection of J. Charles Jennett, an outstanding engineering educator, as dean of the College of Engineering on July 1, 1981. Under his direction two other outstanding members from the engineering field were appointed, A. Wayne Bennett as head of the Department of Electrical and Computer Engineering and C.E.G. Przirembel as head of the Department of Mechanical Engineering in fiscal year 1981-82.

Instruction

There is a clear relationship linking the instructional programs within the college to research and public service, the other primary mission of the University. Nine undergraduates, 12 master's, and nine doctorate programs are offered. Six basic and four advanced-level engineering programs, plus the engineering technology program, are accredited by the Accreditation Board for Engineering Technology.

The College of Engineering is the largest academic unit on campus. Fall 1981 enrollment reached an all-time high of 3,104 students, of which 2,864 are undergraduates and 240 are graduate students. A total of 430 or 14.2 percent, are women. For 1981-82, 430 baccalaureate degrees were awarded in addition to 64 master's and 14 doctorate degrees.
An increasingly important educational component is the Cooperative Education program. Approximately 340 engineering undergraduates represent about 86 percent of all students in this program. Cooperative Education is a voluntary program and consists of a minimum of three semesters of work periods in industry alternating with semesters of full-time study. The program provides students with challenging, planned work experiences related to their college curriculum. In addition, the contact with about 200 Southeastern organizations brings the College of Engineering closer to engineering in industry.

Rapidly escalating salaries for B. S. graduates continue to provide a negative incentive for graduate school. This has caused shortages at the faculty level and created strong competition among companies for B. S. graduates. Salaries are at record highs. The average 1982 Clemson engineering graduate had more than three job offers and began his career earning about $24,600 per year.

The demand for women and minority engineers continues to increase. To meet these challenges, the college has set a goal of increasing minority enrollment by 5 percent a year through the 1980s.

The National Consortium for Graduate Degrees for Minorities in Engineering has recently accepted Clemson University into membership. The group’s membership now includes 42 companies and 40 universities whose primary purpose is to increase minority enrollment in engineering graduate schools. The consortium grants $5,000 tax-free fellowships in engineering to qualified minority graduate students and guarantees the students challenging summer work during their schooling.

The fifth year of the summer engineering program for minority high school students continued that program’s record of success. More than 300 qualified students have attended this program, which is sponsored by industry and foundations.

Within the Department of Electrical and Computer Engineering the summer Master of Engineering program is funded totally by the Western Electric Co. Begun in 1980, the program had 34 students and the first group of students will graduate in 1983.

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

The collaboration of the Engineering Technology Department with the technical school system of the State has enhanced the transferability of
students from the 16 South Carolina technical schools to ET at Clemson. Articulation efforts, without loss of academic quality, have smoothed the way for students to continue their education for a four-year BSET degree from Clemson.

Research

The Clemson University College of Engineering is an active center of engineering research and technological innovation. Total expenditures for research during 1981-82 rose to approximately $3.3 million on 113 active projects. This money was obtained from government agencies and industrial sponsors under highly competitive conditions, a tribute to the faculty's professional capabilities and performance. The dollar volume of new research awards was $2.4 million. Eighty-five faculty were engaged in research during 1981-82. Their efforts were supported by 96 graduate and 97 undergraduate students. Total research grants-in-force, including multi-year contracts, exceeded $6.1 million.

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.

With approval from the S.C. Commission on Higher Education, the College of Engineering established in 1981 the Engineering Center for Automated Manufacturing Technology. The center will promote and develop projects that link faculty research interests with industry needs in high technology areas such as robotics, automated machines, computer-aided design and manufacturing (CAD/CAM), materials for manufacturing and systems and industrial engineering.

In the past year, the South Carolina Energy Research and Development Center was also established at Clemson with approval and funding from the General Assembly. The charter for the center includes the following missions: (1) to promote and encourage energy conservation, education, research and development in and for the state of South Carolina; (2) to be a liaison for energy activities involving local, state, and federal agencies, industry and educational institutions; (3) to help transfer energy technologies for other research activities to South Carolina; and (4) to contribute to national energy issues in selected areas of excellence.

Significant progress is being made in the South Carolina NSF Experimental Program to Stimulate Competitive Research (EPSCoR). Funds have been used to attract and develop research teams. Specifically:

- A three-year grant of $151,000 allows Clemson bioengineers to study bone strength in a variety of animals.
- Environmental systems engineers study the effects of toxic chemicals in the environment and methods of removing such materials from wastewater discharge. Funds in the amount of $577,000, derived
from various sources including the EPSCoR program, support this new program.

- Mechanical engineers, funded for five years at $500,000, are developing research capabilities in fluidized-bed heat transfer, natural convection in enclosures and droplet evaporation.

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

- Researchers in the Department of Civil Engineering are evaluating the strength of composite masonry walls under static and earthquake loads. This $170,000 project is funded by the National Science Foundation.

- Two new research projects of the Clemson Hydraulics Laboratory involve evaporation measurements and the analysis of optimal bulkhead designs for coastal protection. The National Science Foundation is sponsoring a two-year $104,800 evaporation study to develop new techniques to measure lake evaporation, and a one-year grant to produce bulkhead designs is being funded by $22,300 from the S.C. Sea Grant Consortium.

- Environmental systems engineers have started research on the rate of breakdown of man-made organic compounds by bacteria in the natural environment and in wastewater treatment systems. This three-year project is supported by the National Science Foundation in the amount of $114,400 for the first year.

- A research effort has been started by the Engineering Technology Department with Tungsten Industries in Greenville to study the further automation of their bur-grinding machines.

- Systems engineers are developing a unified data base of human resource information which can be used to design weapons systems with lower operating costs. This $1.4 million project is funded by the United States Air Force.

- Electrical engineers are studying the fabrication and properties of very small transistors. This project has more than $250,000 in research support from the Office of Naval Research, the Rome Air Development Command, the Naval Research Labs, and the National Bureau of Standards.

- Solar cell reliability research is continuing in the Department of Electrical Engineering with the expenditure of approximately $540,000 sponsored by the Jet Propulsion Laboratories for the Department of Energy.

- Mechanical engineers are completing a major study on seismic loading of cable tray hangers in nuclear power plants. The results of this study will provide the Edison Power Research Institute (EPRI) design criteria for safer power plants.
Ceramic engineers have developed special coatings for brick that make them more effective solar energy collectors. A series of test rooms has been built to get design information on the Clemson coatings and other aspects of passive solar design. This $70,000 project is funded by the Department of Energy and the Brick Institute of America.

Several college faculty received special recognition for their accomplishments. Environmental systems engineer Ben Dysart won the sixth annual McQueen Quattlebaum Faculty Achievement Award for contributions in water quality and environmental protection research and teaching. Civil engineer Jack C. McCormac received a Special Citation Award from the American Institute of Steel Construction for exceptional professional achievement and creative contribution to the art of steel construction. Linvil G. Rich was named Alumni Professor of Environmental Engineering. Ceramics engineer Gilbert C. Robinson received the American Society for Testing and Materials Award of Merit and the A. F. Greaves-Walker Award presented by the National Institute of Ceramic Engineers. Two faculty addressed international meetings in Germany and Sweden.

Public Service

The needs of the engineering community are served by providing a wide spectrum of opportunities for continuing engineering education (CEE). Technology transfer to practicing engineers and, through them, to their business or government employers has an immediate and beneficial impact on the State's economy. During 1981-82 engineering faculty served 9,595 people through CEE courses, seminars, workshops and symposia. The Clemson program is the largest in the State and one of the major ones in the nation.

Major conferences included a three-day Fiber Producer Conference and Exhibition attended by more than 2,800; a three-day Plant Operators Forum for manufacturers of ceramic products attended by 379; a one-day workshop on Technical Problems Dealing with Insulation attended by 116; and a two-day conference on Single-Ply and Modified Bituminous Roofing Systems attended by 94.

The annual series of Reviews and Updates was taught in five cities and included 27 subjects of interest to practicing engineers. More than 550 engineers participated in an average of more than five classes each.

Other short courses and workshops representative of the 322 CEE programs conducted are boiler efficiency workshops for industry, short courses on soil mechanics, computer graphics and design, improving technical presentations, productivity improvement for industry, and microprocessor applications.
COLLEGE OF FOREST AND RECREATION RESOURCES

The departments of Forestry and of Recreation and Park Administration make up the College of Forest and Recreation Resources. In addition, the Energy and Resource Development Institute (ERDI) operates under the auspices of the College to investigate the management and development of energy resources in the Southeast.

The college offers the only teaching, research and public service programs in South Carolina in the fields of forestry, wood utilization, and recreation and park administration. The college is dedicated to promoting the wise management, use and stewardship of the State's forest resources and enhancing the quality of life of its people through a rewarding use of leisure.

Department of Forestry

As the only university in South Carolina with a forestry department, Clemson has the unique opportunity to supply the foresters who manage the 12.5 million acres of forest land in this State. In fact, more than 50 percent of the graduates to date have stayed in South Carolina to meet this objective. Clemson's curricula emphasize the role of wood as a basic forestry resource. They provide for study in the areas of wood use of forestry management.

The past year has been one of leadership changes. A new department head, undergraduate curriculum chair, graduate program coordinator and department research coordinator were chosen in 1981-82.

The faculty participated in numerous professional activities and gave several presentations on their research. D. H. Van Lear completed his chairmanship of the Task Force on Appropriate Use of Silviculture Systems for the Society of American Foresters, and was recognized by the Society for outstanding leadership, knowledge, and devotion in the preparation of the book Choices in Silviculture for American Forests, which is a layperson's guide to sound forest management practices.

In all, the forestry faculty published approximately 50 papers during the year, including nine departmental bulletins, technical papers and research series.

Teaching

During the academic year, 27 candidates received the Bachelor of Science degree; 21 graduated from the forest management program and six from the wood utilization program. Ten graduate degrees were awarded: seven Master of Science degrees and three Master of Forestry.

For the third straight year the faculty concentrated its recruiting efforts on informing guidance counselors and prospective high school students about forestry careers and Clemson's program. Public and private schools...
were visited throughout the State. The drive culminated in May with the third annual forestry weekend for prospective forestry students. Students from all over South Carolina visited to see the facilities and hear about programs in forestry.

A major highlight of the year was the approval of the Ph. D. program in forestry by the South Carolina Commission on Higher Education. The addition of this program will strengthen both teaching and research programs and improve the University’s ability to find solutions to the State’s forest problems.

For the second consecutive year, the forestry faculty taught two three-week continuing education sessions in silviculture to U. S. Forest Service personnel. The choice of this department as the sponsor is a credit to its reputation in silviculture. Clemson’s excellence in silviculture was further recognized this year when the Forest Service located a new piedmont hardwood research unit here.

Research

Research in the Department of Forestry is undertaken in timber production, forest management, wood utilization and biological productivity.

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 which prevent full timber productivity.

In addition to the approximately 25 state and federally funded projects already going on in this area, new projects were begun to study the compartmentalization of oak tissues by decay organisms, the structure and development of hardwood coppice stands, decay organisms in trees colonized by red-cockaded woodpeckers, and the biology and production of littleleaf-affected shortleaf pine stands.

Another 20 projects in this area are supported by grants from the Forest Service, other federal agencies, private industry and State agencies. The Forest Service, through the Southeastern Forest Experiment Station, began funding the following projects over the past year:

- Study of natural variability in soil and nutrient export in ephemeral streams in the piedmont — $11,600
- Compilation of available technical information for using low-cost silviculture to rehabilitate low grade forest stands in South Carolina — $9,000
- Growth and development of crop trees from natural hardwood coppice following clearcutting in the upper piedmont — $24,800
- Growth, decline and mortality of urban red oaks in northern Georgia — $2,531
The United States Department of Agriculture Integrated Pest Management Program provided $52,760 for four projects in the area of southern pine beetle research and funded a new project for the development of impact models for the southern pine beetle pest management program.

Two projects funded by the Georgia Forestry Commission were completed. The first study concerned the amount and control of sprouting from sheared and chainsaw-cut hardwood stumps. The second dealt with the effects of prescribed burning in mixed pine-hardwood stands of the Southern Appalachian Mountains. Publication of the results of both studies is forthcoming through the Georgia Forestry Commission.

Research in the forest-management area seeks solutions to forest-based, multiple-use problems. New projects begun this year include studies on the variation in water quality and quantity in the South Carolina piedmont, the impact of beaver on the piedmont forests of South Carolina, vegetation response to recreation use and the use of snag trees as wildlife habitat. These studies, and ongoing state studies in multiple-use management and small private landowner characterization, complement each other.

The Forest Service funded $4,859 for a study on firewood consumption and marketing in urban areas of South Carolina, while the Aluman Corporation gave $83,050 for a study of the dynamics of harvesting for the Mt. Holly Plantation deer herd near Summerville, South Carolina. The latter project is a cooperative project between the Forestry Department and the Department of Entomology, Fisheries and Wildlife.

DuPont Corporation awarded $34,972 for a study on the potential biological effects of intensive forest management for energy on-site productivity in the Atlantic coastal plain.

Wood utilization research ranges from the use of cardboard mulch around Christmas trees to weight loss in loblolly pine trees stored with the crowns intact. Two new state-supported projects began this year. The first is a comparative study of the shrinkage of wood dried by conventional versus high frequency-vacuum drying methods, and the second studies BTU values of selected hardwood stems and branches. The U. S. Forest Service gave $13,695 for a study to compare drying degrade and yields in hardwood furniture dimension parts dried by a high frequency-vacuum system and a conventional kiln.

Faculty who research biological productivity are all in the South Carolina coastal plain at the Belle W. Baruch Forest Science Institute near Georgetown and at the Forest Sciences Laboratory in Charleston. This arrangement with the Charleston laboratory began this year and uses the cooperative efforts of both Clemson and the U. S. Forestry Service scientists.

Some of the more than 15 ongoing State-supported projects this year are the examination of several properties of turkey oak and its potential for
culture on dry sites, a problem analysis of the physiology and ecology of wetland sites and a monitoring of groundwater on the Hobcaw Barony.

Four grants were completed during the year. A report, "The Influence of timber harvesting on the red-cockaded woodpecker," was sent to the U. S. Forest Service, and "Assessment of the impact of feral ungulates on the vegetation of Shackleford Bank, Cape Lookout National Seashore" was sent to the National Park Service. A study of woodcock habitat use and availability on the Francis Marion National Forest also was completed. Finally, data from a species site study on wetland forests begun by the Forest Service in 1960 were analyzed. A paper detailing the results was published.

**Extension**

Extension Forestry initiated "Christmas Tree Notes," a new series for Christmas tree growers. The first note, "A Guide to Shearing Pines for Christmas Trees," is one of three to be published yearly to provide updated management information on Christmas tree farming.

Because of high prices, it has become difficult to interest landowners in intensive mechanical site preparation for reforestation. Natural regeneration, a viable alternative, is receiving considerable attention throughout the State. Extension Forestry conducted four natural regeneration workshops for the Soil Conservation Service to familiarize their field personnel with these practices enabling them to discuss the new methods with landowners. Other activities in this area are the preparation of a circular for professionals on natural regeneration of pine and the incorporation of natural regeneration data into the "Forestry as an Investment" publication.

During the past year we have encouraged county Extension offices to form county landowner forestry associations. Laurens County is in the process of forming an association, while other counties are seriously exploring the possibility. Forestry landowner associations are an excellent mechanism to keep landowners updated on forest management practices.

**Department of Recreation and Park Administration**

**Teaching**

A proposal for an emphasis area in travel and tourism which was developed, presented, approved and forwarded to the Commission on Higher Education will be considered in the fall of 1982. A proposal for the Master of Science degree in recreation and park administration also has been approved at the University level and is undergoing review by the Commission on Higher Education.
Research

Another first for research in this department occurred in March when a research coordinator for the National Park Service was stationed at Clemson. This study unit, housed with the Department of Recreation and Park Administration, works closely with the department.

The research unit conducts studies related to travel and tourism, visitor services, and maintenance and operation of national parks. Plans to encompass energy issues and visitor information systems are under way.

Funding of about $100,000 is proposed for projects related to Cape Hatteras aesthetics, maintenance and interpretation on the Blue Ridge Parkway, energy conservation techniques in park environments, and water supply systems for park areas. Funding for at least three additional projects totaling about $120,000 is anticipated for 1983. One research associate has already been hired by the research unit, and another is anticipated as funding becomes more firm.

The department in its continuing relationship with the National Park Service, was given a $10,000 supplement to continue work on a travel and tourism study begun in 1981.

Two faculty members received grants from the Clemson University Faculty Research Committee — one to explore corporate philanthropy in South Carolina, the other to examine select attributes of recreation for the aging. One of our graduate students received the prestigious Wesley Ballaine Research Award, sponsored by the Travel and Tourism Research Association International, presented annually to the student who demonstrates excellence in student research and writing.

Many projects begun in previous years were completed in 1981-82. The number of resulting technical reports and journal articles attests to the fact that RPA at Clemson is becoming more visible in the fast-growing field of recreation research.

Extension/Continuing Education

The following workshops in Extension/Continuing Education were offered by the department:

- The executive development workshop for the U. S. Forest Service
- Three workshops sponsored by the National Park Service
- A workshop for swimming pool operators developed and cosponsored by the South Carolina Department of Health and Environmental Control
- Two tourism development workshops sponsored by the Discover Upcountry Carolina Association.
- The 12th college week for senior citizens
- A variety of one-day training programs developed under the sponsorship of the South Carolina Recreation and Park Society.
Extension/Camping

Six summer residential camping programs for handicapped citizens were conducted at the Recreation-Outdoor Research Laboratory. Retarded children and adults, children with hemophilia, visually impaired children, diabetic youngsters and young people with emotional disorders benefited. Financial support for these programs was increased by the two principal sponsors, the South Carolina Jaycees/Jaycee-ettes and Sertoma International of South Carolina.

Senior Adventure Camp for the elderly was held at the outdoor laboratory during September. Camp directors recruited students for summer camp jobs on Camp Placement Day. More than 30 directors interviewed approximately 350 Clemson students.

Extension/Technical Assistance

Technical assistance is in increasing demand. Assistance is provided for site planning, agency evaluations, evaluation of staff needs, discussion of land acquisition alternatives, development of interpretative programs for senior citizens, consulting on employee fitness programs and review of departmental bulletins.

Assistance was rendered to the following agencies: Roxie Anna Children’s Home in Seneca, Piedmont Presbyterian Camp, Christ Road Baptist Church in Seneca, Town of Lexington, City of Orangeburg, Clemson Downs Retirement Center, Mental Health Association of Greenville, Town of McCormick, Cannon Mills, Town of Moncks Corner, Camp Fellowship, Town of Cheraw, Irmo Recreation Commission and the Cooper River Recreation Commission.

Energy and Resource Development Institute

Even though the Energy and Resource Development Institute (ERDI) began fiscal year 1981-82 with sharp funding curtailments resulting from federal program cut-backs, the year witnessed several notable accomplishments and ended with a promising outlook for the coming years. Funding to underwrite seed project development was cut off. However, the U. S. Forest Service did continue a $50,000 cooperative agreement to support ERDI operations.

In addition to operating expenses, ERDI developed Forest Service support for the following:

- An assessment of residential fuel wood consumption, conducted by A. Marsinko, Clemson Department of Forestry;
- Design of experiments to determine the effects of vegetation on residential energy consumption, conducted by D. Berrier, K. Bush, and H. K. Cordell.

The USDA Agricultural Research Service provided extramural salary support to design and construct a prototype, multi-therm solar house
which is the result of a 1981 arrangement between the Clemson University Foundation, Inc., ERDI, and the USDA Rural Housing Research Program. The project involves construction of a series of houses to assess energy conservation techniques, materials and site preparations. When the research is over, the houses will be sold. Proceeds will go the Clemson University Foundation, Inc. to underwrite future ERDI programs, operations and housing research. Construction began on the first house in May 1982 with its completion anticipated for fall 1982.

Private contributions and sponsorship for the house have been received from the following:

- The Carolina Masonry Association
- Upper South Carolina Masonry Contractors Association
- The American Enka Corporation
- Santee Cement Company
- Wilson Brothers Sand Company
- Phillips Petroleum Geotextiles Group
- The American Brick Institute

ERDI took an active role with Clemson's Department of Recreation and Park Administration to locate the USDI National Park Service Cooperative Park Study Unit (CPSU) at Clemson. A project, in cooperation with the CPSU and the University of Tennessee, is scheduled to begin in fall of 1982 to assess the use of information as a mediating factor in visitor perception of energy conservation practices in national parks.

A second regional project negotiated in 1981-82 to begin in fall 1982 is an assessment of potential use of wood residue for industrial energy production. This project will involve scientists from Clemson's South Carolina Energy Research Development Center, University of Georgia, Western Carolina University, Virginia Polytechnic Institute and the U. S. Forest Service.

ERDI will conduct two regional workshops addressing the effects of energy cost and availability on recreation and regional lifestyles and on forest economic production. The workshops, scheduled for fall 1982, are sponsored by the U. S. Forest Service and will result in the development of regional priorities.

Publications during 1981-82 included two scholarly journal articles, one paper in an edited textbook, two published agency technical reports and one published abstract. In addition, three formal papers were presented at professional conferences and before federal agencies. Numerous lectures were presented to university classes, national and regional associations, and community and business groups.
COLLEGE OF LIBERAL ARTS

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

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

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

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

Service

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

The Department of Languages continues to stress a practical, business orientation by encouraging Clemson students to minor in a modern language while majoring in business administration, engineering or textile science. Given the large foreign investment in South Carolina industry, this is an important career option for the State's students.

The Languages Department annually sponsors "Dionysia," a foreign language drama festival with several dozen casts from four states competing in four languages. It also sponsors a Language Declamation Contest which annually draws hundreds of participants from several states. The department also conducts a foreign study program in France.

Improved energy education in South Carolina's public schools is the goal of the Energy Institute, conducted by the Political Science Department with funds from the U.S. Department of Energy. Thirty science
and social science teachers from South Carolina secondary schools participate in this summer institute annually.

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

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

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

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

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

Professional Activity and Scholarship

Two publications of national interest emanate from the College of Liberal Arts. The "South Carolina Review" is edited and published by the Department of English. This distinguished journal provides a forum for distinctive literary scholarship and original poetry and fiction.

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

The Department of History continues to spread the name of the University through a free, syndicated book review column published in 89 newspapers in 38 states with a readership of three million people. This history book review service is the only such regular newspaper feature by an institution of higher education. The department also sponsors a popular radio program, "The Latin Beat," covering the wide range of Latin
American music. "The Latin Beat" is broadcast over the South Carolina Educational Radio Network as part of the department's public service effort.

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

Scholarly gatherings are regular features of the activities of the College of Liberal Arts. The History Department co-sponsored an extremely successful conference titled "Sport and Society" and another on "Perspective on Aging," and the College of Liberal Arts Lecture Series dealt with "Human Being, Being Human."

COLLEGE OF NURSING

The College of Nursing is a valuable resource linking the University to the community. Within the framework of the University's mission, the College of Nursing provides programs of instruction, research and service which contribute to individual and community health. The College of Nursing helps to ensure the vitality of the University and the achievement of its mission through development of an educated citizenry knowledgeable about health and motivated to achieve it.

Guided by this concern for the health and welfare of society, college faculty and students are actively involved in building bridges of understanding between the academic world and its constituents through:

1. Preparation of practitioners of nursing highly competent to provide nursing care in a variety of clinical settings. Students are prepared to care for the ill, injured and infirm, and to provide leadership for programs aimed toward promotion and maintenance of health.

2. Clinical studies to examine the effectiveness of practice and broaden the knowledge of nursing practice.

3. Services to develop an educated citizenry, knowledgeable about health and motivated to achieve it.

Undergraduate Program

Throughout the year this program has been reviewed and evaluated by faculty and students. These efforts lead to recommendations to expand clinical components in the program and to separate clinical and didactic portions of nursing courses into separate courses which will be graded individually. There were also some changes in research and leadership content.

Faculty are sharing information on the baccalaureate program with programs preparing nurses at junior and community colleges, an effort that will be helpful in the admission and progression of registered nurses entering the baccalaureate program.
To improve admission and progression of all nursing students, all nursing courses in the baccalaureate program will be offered each term, beginning in fall 1982.

A number of requests have been directed to the College of Nursing to offer upper division nursing instruction in the Greenville area. These requests have come primarily from registered professional nurses who want to study nursing on an advanced level and from employers of nurses eager to obtain highly qualified staff.

An Honors Program in nursing has been developed and students may begin honors courses in fall 1982.

The baccalaureate program was reaccredited in 1981 by the National League for Nursing for eight years — the maximum number of years for which this agency accredits programs. Also, the State Board of Nursing for South Carolina provided this program full accreditation.

Master's Program

Elizabeth Baines, R.N., a specialist in gerontological nursing, joined the faculty in 1982. Since her appointment, Dr. Baines has helped to develop further clinical instruction in gerontology for masters students of nursing and undergraduate students, and has helped to develop further College of Nursing affiliations with community agencies caring for the aged.

In 1981 this program also received initial full National League for Nursing accreditation for the maximum term of eight years.

Continuing Education

In its fifth year of operation the Continuing Education Program served more than 550 people through 27 workshops, conferences and noncredit short courses.

Several new initiatives include a home study series in Pharmacology for Nurses, which was launched in 1982, and a study tour to the People's Republic of China is planned for November 1982. An advisory committee of nurse experts has aided in the planning of a certificate series in Emergency Nursing. This series will build on the earlier five year grant from the Appalachian Regional Emergency Medical Services Council. Additionally, the first phase of a series for Nurse Executives was inaugurated.

In April 1982 the continuing education program achieved initial full accreditation by the Eastern Accrediting Committee of the American Nurses' Association.

Nursing Research

Ongoing faculty research projects include "Life Change, Emotional Support System and Incidence of Illness," "Effects of Nursing Interven-
tion on Adjustment of Individuals Undergoing Radical Surgery,” and “Acceptance of Illness, Knowledge, and Compliance in Adults with Diabetes Mellitus.”

In early 1982 a Nursing Research Newsletter was started, containing information on sources of funding, a call for papers and proposals, abstracts of current faculty and student research, and other research items of interest. The newsletter is circulated monthly.
COLLEGE OF SCIENCES

The number of students majoring in scientific disciplines, with one exception, has remained fairly constant, probably due to continuing interest in health, environmental and energy-related problems. The number of majors in computer science has increased beyond expectation. The demand for classes in all the sciences continues to expand each year due to an increase in the number of majors in other technical curricula. As a result the College of Sciences is responsible for more than 30 percent of the total University teaching load although it has only 23 percent of the faculty.

Faculty in the College of Sciences have more than $5 million in contract research funds from both federal agencies and industry. This figure is up by $1 million from 1980-81. The college plans to add an associate dean whose major duties will be to improve relations with industry, government agencies, and private foundations to increase external funding for research and instruction.

Most faculty members are active in national scientific societies with some serving as officers. An increasing number are being invited to present lectures at international conferences in addition to their continuing involvement in national meetings of the various societies.

Department of Biochemistry

This was a very active year for the Department of Biochemistry. Clemson University was represented by the department at four international meetings, including one at the Royal Academy in London. The department also represented Clemson well at national and local meetings.

This year the faculty held five outside research grants from the National Institute of Health, the American Heart Association, and the Eloise Gerry Foundation, totalling over $150,000. These grants covered areas of research on the effect of serotonin on melanoma cells, interactions in complement, and the interactions of protein and lipids. Six manuscripts were published this year. One faculty member taught for a portion of the year in Hamburg, West Germany.

New research areas added to the department include fundamental work on protein refolding and low molecular weight ribonucleic acids.

Botany Department

Research in the Botany Department is providing new insight into how plant cells increase in size and produce cell walls, and also into the ways plants govern their photosynthetic rates. While purely "basic" plant science in nature, these investigations may lay the foundation for new methods for control of size, shape and productivity of fruits and grains.

Other departmental research has shown that as global carbon dioxide concentrations increase, the Arctic tundra will actually become an addi-
tional source of carbon dioxide and possibly exacerbate the problem. Additional departmental studies indicate that increased carbon dioxide can change the types of weeds that infest some areas depending on the photosynthetic pathway used by the plants.

In cooperation with the Department of Forestry, the department will soon begin a botanical garden where plant habitats will be defined. Collections of live plants will be moved from comparable habitats to show the many living plants that can be found in similar habitats.

At the request of the College of Agricultural Sciences and the College of Forest and Recreation Resources, the department is teaching a new introductory botany course, Plant Form and Function.

This year the department awarded five Master of Science degrees. Fifteen students were enrolled in the graduate program (eight M. S. and seven Ph. D.). The faculty also had more than $100,000 in research grants from NSF, the U. S. Army, World Health Organization and the University; produced seven publications in refereed journals; and delivered six invited seminars.

The Department of Botany is developing an interdisciplinary limnological research facility on Lake Keowee, through the cooperation of Duke Power Company. When operational, the facility will improve research opportunities in limnology, fisheries, hydrology, lacustrine dynamics, aquatic botany and zoology. Located only eight miles from the campus, the facility will be used for teaching and research.

**Department of Chemistry and Geology**

Progress continues to be made in terms of research productivity, papers and books published, invited lectures and grants, with the newer members of the faculty contributing a greater share.

The faculty received 12 new research grants, eight in chemistry and four in geology, in addition to five contracts that were awarded to chemistry faculty members. Two of the chemistry grants were for cooperative research — one to be carried out with scientists at the State University of Campinas, Brazil, another with a group in France.

The chemistry faculty published 40 papers in 1981-82; the geologists had five. The faculty gave 21 invited lectures in the United States, and two chemistry faculty members presented five lectures overseas. Twenty-two papers were presented at scientific meetings, one poster paper was presented and one book published.


Diamond Shamrock Corp. has funds for the Jack Williams Scholarship to be awarded to a junior or senior undergraduate in chemistry. The
recipient will be selected by the department based on academic ability, preference being given to a student planning to continue with a career in chemistry after graduation. Williams was a student at Clemson who later became vice president for academic affairs.

Minor equipment was purchased for the undergraduate analytical and organic chemistry and geology laboratories, including an infrared spectrophotometer and a gas chromatograph. The department hopes this is a good beginning toward upgrading the antiquated equipment currently in use in teaching labs. A new building for the department of chemistry has been approved by the General Assembly. Architects and consultants are to be selected soon.

Darryl D. DesMarteau will assume the duties of department head in August 1982. Dr. DesMarteau comes to Clemson from Kansas State University where he established an international reputation as an organic chemist.

Department of Computer Science

During its fourth year of operation, and its second year offering degree programs, the Department of Computer Science continued its rapid growth. The number of majors increased to approximately 350 B. S. and 20 M. S. students, an increase of about 70 percent in each program. There were 18 B. S. graduates and one M. S. graduate in 1981-82, and these graduates continued to be in high demand by employers.

Response has been good to the course offerings at night in Greenville through the Clemson at Greenville TEC program. Projected enrollments have been met or exceeded, and future demand appears to be high based on current enrollments in the feeder course offered by Greenville TEC.

The department began a serious effort to build research programs, especially those activities involving outside funding. As a result one faculty team secured a large research contract from the Department of Defense, and the prospects appear to be good for other proposals to be funded.

In May 1982 the department moved from Martin hall to the College of Nursing building. While this move solved immediate requirements for additional space, the office space that was made available in the Nursing Building has been completely filled and laboratory space is inadequate. The move can only be viewed as temporary, and a permanent solution to the space problem must be found.

The most serious problem in computer science continues to be faculty recruiting. Although Clemson was fortunate to attract three outstanding new faculty members last year, there are still vacant positions. This causes serious problems in meeting the demand for computer science courses.
Department of Mathematical Sciences

Fall 1981 undergraduate student credit hour production of the Mathematical Sciences Department was over one-eighth that of the entire University, and the doctoral level credit hour production was almost one-eighth of the total.

During the 1981-82 academic year 38 students received baccalaureate degrees in mathematical sciences and 29 received masters' degrees. In addition, two students whose dissertations were directed by faculty of the department received doctoral degrees.

With the support of a four-year grant from the National Science Foundation, "An Alternative in Higher Education in the Mathematical Sciences," the department developed applications-oriented graduate programs integrating all the mathematical sciences. These programs continue to serve as models for the development of new graduate programs throughout the United States. The Provost's Academic Planning Committee designated the department's doctoral program as a "Center of Excellence." Only two among the University's 28 doctoral programs earned such a designation. Additionally, the New York Times education editor cited the department's undergraduate programs in applied mathematics as being worthy of strong consideration by those planning to attend college.

The many noteworthy accomplishments of the mathematics faculty include one being named to fellowship in the International Statistical Institute, one being named a Clemson University Alumni Professor, and another being named South Carolina Outstanding Math Educator.

University research contracts and grants in force initiated by faculty of the Mathematical Sciences Department amounted to approximately $660,000. This amount includes a 12-year contract with the Office of Naval Research. Also included is the second year of funding of the department's five-year, 12-participant research grant in discrete structures through the NSF Experimental Program to Stimulate Competitive Research in the Sciences.

The Mathematical Sciences Department, with its multi-disciplinary faculty and its applications-oriented programs, continues to be a vital resource of the University.

Department of Microbiology

The Department of Microbiology had a productive year in teaching and research programs. Twenty-nine B. S. and six M. S. microbiology degrees were awarded, and two microbiology majors, J. W. Gilpin and W. K. Besson III, were recognized for outstanding academic accomplishments by being awarded the "Norris Medal" and the "Faculty Scholarship Award," respectively.

Microbiology graduates comprised more than 50 percent of all Clemson students being admitted to medical and dental schools. During the
year 1,168 undergraduate and 167 graduate students were instructed in a total of 2,726 semester credit hours. The department provided a number of service courses to a variety of majors, including nursing, medical technology and agricultural sciences. A new graduate course was introduced in the area of genetic engineering as well as a senior course dealing with cancer and aging. The doctoral program, initiated in August 1981, got off to a good start with seven students enrolled.

The faculty maintained a diverse research program in both basic and applied areas. They held some $800,000 in research contracts and grants and they published a total of 20 articles in professional journals and books. There was active participation at professional meetings with some 30 papers being presented. Invited talks were given at several universities, including Harvard, the University of Birmingham, England, and the Gamalya Institute, U.S.S.R.

Department of Physics and Astronomy

The department's Ph. D. program entered its third decade this year. Funds for research programs came from several sources including industry and the federal government. Research on the theory of nonwoven fibers, an important new interest of textile manufacturers, is supported by a major textile firm. A unique research facility, the metallic whisker laboratory, has received additional substantial support from the National Science Foundation. Two programs in atmospheric physics have been supported by NASA, while crystallography has been funded by the U. S. Department of Agriculture and EPSCOR (a special NSF program). NATO has sponsored travel to a French national research center for a faculty member and a graduate student. Another faculty member was awarded one of the first new Provost Research Grants. The biophysics program has received continued support from the National Institute of Health.

The department's undergraduate programs have made increased use of computers in instruction. Two telex terminals have been added while minicomputers have been integrated into both instructional and research laboratories. NSF provided partial sabbatical leave support for one faculty member to work in England in an institute devoted to computer-assisted instruction. Undergraduate astronomy instruction was enhanced by increased use of our planetarium. New programs designed to appeal to high school students also made use of this facility.

A new summer science camp for high school students was initiated this year. One faculty member designed a course for this camp which introduced students to computer interfaced physics. A heavily attended Astronomy Day gave the general public and local amateur astronomers an opportunity to view sunspots, the moon and several planets through the department's telescopes.
Evidence for the maturity of the graduate program may be seen in the publication record of the faculty. In a recent survey by the University, the department had the largest number of publications. For the first time, a faculty member published a research monograph, a book defining a new area of research. Further evidence of the maturity of the program can be seen in the international visibility of the faculty. Six faculty members lectured in foreign countries including Canada, England, France, West Germany and the Soviet Union.

Service activities outside the University are important both for the department and the community. One faculty member participated in the South Carolina Junior Science and Humanities Symposium, while another was elected to the governing council of the Southeastern Section of the American Physical Society. Several members continued to participate in the programs of the South Carolina Academy of Science.

**Department of Zoology**

In the 1981 fall semester, 91 students were pursuing the B. S. degree in zoology. Nineteen graduate students were enrolled in the M. S. program and 25 in the Ph. D. program. Zoology has the largest doctoral program at Clemson. During the 1981-82 academic year, 26 students graduated with the B. S. and 4 with the M. S. degree.

Research and training activities were supported by 13 outside grants or contracts: four from the National Science Foundation, three from the U. S. Army, two from the U. S. Forest Service, and one each from the National Institutes of Health, South Carolina Sea Grant, U. S. Department of Agriculture, and Electric Power Research Institute. One faculty member and his doctoral student participated in a contract with Diamond Shamrock. Since 1974, the department has attracted outside funds approaching $1.8 million to support research and graduate training activities.

Small grants received during the year include three Faculty Research Grants, two Provost’s Awards, and funds from the American Philosophical Society and Highlands Biological Station.

Scholarly activities by faculty and students during the year included six papers presented at five different international meetings and at least 22 papers presented at national and regional meetings. Twenty-four scientific papers, 2 book chapters or review articles and 22 abstracts, reviews or notes were published. A doctoral candidate in our department was selected for the Best Paper Award by the Division of Developmental Biology of the American Society of Zoologists.

Professional and service contributions by members of the faculty include the following activities: organization of a meeting of population geneticists in the southeastern region; chairman, Heritage Trust Advisory Board of South Carolina; secretary, Animal Behavior Society; chairmen of committees of the American Ornithologist’s Union, Wilson Ornithologi-
cal Society, and Southeastern Society of Parasitologists; advisory panel, Instructional Scientific Equipment Program, NSF; board of reviewers for Transactions of the American Microscopical Society; member, Rhodes Scholarship Selection Committee of South Carolina; associate editor, Journal of Experimental Biology and Journal of Environmental Biology of Fishes; technical editor, Journal of the American Killifish Association; ad hoc reviewer, National Research Council Study of Ph. D. Programs; etc.

Faculty members gave 14 seminars at other institutions, and 10 outside speakers visited our campus and presented seminars.

Our vertebrate museum continues to expand and is a valuable resource in our teaching, research and public service roles.

The most significant enhancements to our program this past year have come from the incorporation of microcomputers in the office for word processing and in four research laboratories for control, acquisition and analysis of data. These applications are stretching the useful life of outmoded equipment, opening new areas of training and research, increasing productivity and supporting all aspects of our educational mission.

Biology Program

During 1981-82, 5,040 students were enrolled in courses offered by the Biology Program. Fifty-two laboratory sections per week including 12 night laboratories were taught by Biology Program faculty and graduate students from the departments of Biochemistry, Botany, Microbiology and Zoology. A new laboratory room was added for teaching in 1982.

The Teacher Information Processing System, a program designed for computer-assisted instruction, was shown to be successful in helping students master material and score better on examinations. This system provided the basis for two grant proposals and will be incorporated into the development of a learning center.

More than 60 high school teachers attended the summer short course program in biology. The program is being expanded to contract course offerings to school districts throughout South Carolina. Faculty developed a second series of 30 short laboratory exercises for distribution to South Carolina teachers through the South Carolina Science Council. The faculty also participated in the development of the South Carolina Competencies in Biology to be distributed by the State Department of Education.

Activities of the faculty included: a two-week Workshop for Advanced Placement teachers; workshops presented at the National Association of Biology Laboratory Educators, South Carolina Association of Biology Teachers and South Carolina Junior Academy; papers were presented at the National Association of Biology Teachers, National Science Teachers Association and South Carolina Academy of Sciences. Faculty also partici-
participated in the National Convocation on Precollege Education in Mathematics and Science, sponsored by the National Academy of Sciences.

Four laboratory manuals were revised and reprinted and three papers were published in professional journals.

**Medical Technology**

The Medical Technology program at Clemson University is now in its second decade. A new committee structure for the program was organized this year. In addition to the medical technology program coordinator, the faculty advisers, and two students, the new committee now contains a medical director and educational coordinator from the hospital staffs. It is a subcommittee of the Commission on Undergraduate Studies. The committee reviewed the curriculum, the feasibility of Clemson University administering the education program at Greenville General Hospital and reviewed affiliation agreements.

Nine students completed the baccalaureate degree requirements in Medical Technology in the 1981-82 school year, bringing to 109 the total number of graduates in the program. Forty students are enrolled in the program. These students have made outstanding scores on the national certification examinations, and all have found employment in the places of their choice.
GRADUATE SCHOOL

One of the most gratifying aspects of graduate education at Clemson in 1981-82 was the increase in fellowships. With the advent of the R. C. Edwards Research Fellowships and the increase in Graduate Alumni Fellowships, the number of University-wide fellowships has risen from three to 15. Awards have been made to some outstanding applicants. In addition, five awards have been made to black applicants who are residents of South Carolina as part of the State's desegregation effort.

Enrollment in the fall semester 1981 dropped approximately six percent relative to 1980. This is the second consecutive year of this percentage decrease. Total graduate enrollment was 1,834 with 237 in doctoral programs, 570 in Master of Arts and Master of Science degree programs, 648 in professional master's programs, 37 in Educational Specialist degree programs and 342 students with undeclared majors. Of the total enrollment, approximately 425 were enrolled off-campus. In addition, 187 students were enrolled in the Clemson-Furman MBA Program. Enrollment grew at a modest rate in the M.A., M.S. and doctoral degree programs with the decrease occurring in the professional programs and the undeclared majors, that is the part-time student.

Advanced degrees awarded in the year totalled 513, including 33 Ph. D. degrees.

Approximately 40 faculty members and staff attended the sixth annual workshop for graduate advisers held over a two day period in September 1981.

The first four months of 1982 brought a 118 percent increase in Graduate School applications relative to the same period in 1981. What this means with respect to increased enrollment remains to be seen.

The Graduate Student Association was active throughout the year, sponsoring the orientation and social for new students and developing procedures for review of theses and dissertations.

UNDERGRADUATE STUDIES

The Undergraduate Studies Office, in addition to its regular functions, coordinates and administers the summer career development workshops, which bring academically outstanding minority students to the campus before their junior and senior years in high school. Last year 140 rising juniors came to Clemson compared to 60 in 1980, and 34 rising seniors came as compared to 30 the year before. In 1982 there were 36 minority students taking courses at Clemson University who had been recruited through previous minority workshops.

The figures for summer 1982 are even more encouraging, with 140 rising juniors and 86 rising seniors at Clemson for the workshops. A total of 61 students are now students on campus as a result of the minority recruiting program. The program will be expanded again in 1983.
OFFICE OF UNIVERSITY RESEARCH

The Office of University Research provides information and assistance concerning all aspects of the University research effort to faculty members, departments, colleges and other administrative units. Assistance is provided in the preparation and submission of applications for sponsored research, instruction and public service programs. During 1981-82 the office processed 548 faculty proposals. The office provides University liaison between the institution and all public and private, national and local organizations and/or entities concerned with any aspect of research support, regulation or administration.

Guidance and executive support were provided to the University Committee for the Protection of Human Subjects (28 active projects); the Biomedical Research Support Grant Committee (five active awards); the University Research Grant Committee (37 faculty grants, 25 Provost Research Awards); the Committee for Laboratory Animal Welfare; the Institutional Biosafety Committee (one active project); and the Clemson University Patent Committee (16 patent disclosures processed).
During 1981-82 a number of relatively small changes took place which, together, were significant. Circulation and reserve services were extended to 1:00 a.m. on Sundays through Thursdays. At the same time, the hours of reference services were slightly reduced, eliminating service during low-use times to provide additional reference librarians during high-use periods.

The responsibility for the circulation of bound and unbound journals was shifted to the Circulation Unit, freeing much needed time for the reference librarians. The partial card catalogue on the second floor which duplicated the main card catalogue on the main floor was eliminated to make card catalogue cabinets available for the overcrowded main catalogue.

A major internal change was the development of a Library Faculty Rank and Tenure structure. The document explaining this structure establishes four ranks for Clemson University librarians: General Librarian, Assistant Librarian, Associate Librarian and Librarian. For the first time, Clemson University librarians have an alternative advancement track which incorporates the previously existing tenure possibility. Criteria for selection, promotion and tenure are a part of this document.

The library acquired equipment which allows temporary binding of periodical volumes delayed for permanent binding because of missing issues or indexes. These volumes had been held in the Serials Acquisitions Unit and were not readily accessible to users. With temporary binding they can be returned to the shelves for use until they are permanently bound.

The College of Architecture Library Committee was reconstituted as the Architectural Library Advisory Committee. In addition to faculty and students selected by the College of Architecture, this committee has as members the Architectural Library Specialist and the director of Libraries. The committee’s primary function is to advise the director of Libraries on policy matters relating to the Gunnin Library.

Although the policy for non-University related borrowers was not changed, the procedure was streamlined considerably so that transactions were made simpler for borrowers and circulation staff. As a result, borrowing by non-University patrons increased 50 percent.

A weekly staff newsletter called In Touch and a more formal newsletter intended for on- and off-campus audiences entitled The Robert Muldrow Cooper Newsletter improved internal and external library communications.

The College of Commerce and Industry agreed to transfer the responsibility for operating Sirrine Library from their college to Cooper Library.

Physical, administrative and fund raising changes will be implemented in 1982-83. Physically, the Cooper Library will be organized quite differently. The various levels of the building will be renamed and better
identified. The circulating collection will be more logically organized, beginning with “A” call numbers on Level 1 (previously known as the basement) and proceeding upward to “Z” call numbers on Level 6 (previously known as the third floor). There will be one central reference desk located on Level 4 (Main Level). All reference materials, current issues of periodicals, newspapers and periodicals on microfilm will be centralized on the Main Level. The circulation desk will be relocated adjacent to the entrance to the Byrnes Room. The Special Collections Unit will move to Level 2, and the Library Administrative offices will be relocated behind the Byrnes Room in the area which previously housed the library’s Special Collections Unit. Government documents, non-periodical microfilms, technical reports and maps will be centralized on Level 3 (formerly known as the ground floor).

The principal changes in administration will be the merging of the library’s two reference units — Social Sciences and Humanities and Science and Technology — into one unit. A new unit, Public Documents Unit, will be responsible for the collection, organization, promotion and servicing of the library’s non-catalogued collection, U.S. and South Carolina documents, maps, non-periodical microfilms, etc. The titles of those individuals responsible for the various units will be changed from “Librarian-in-Charge” to “Unit Head.”

During 1981-82 the library planned its first major fund raising program as part of the University’s Campaign for Greatness. The program, entitled “Library Patrons of Excellence,” will be the primary fund raiser of a $2 million endowment for the library in the next 10 years. The Library Patrons of Excellence program provides several levels of giving, one of which will be Founding Patrons which requires a minimum of $50,000 gift over five years. Other levels are considerably less but require continuing gifts.

The major addition to the library during the year was the Strom Thurmond Papers. Senator Thurmond signed an agreement with the University to give his past, present and future papers to Cooper Library. Over 34,000 pounds of papers were transferred from Senator Thurmond’s Aiken office to the library in the spring.

The University agreed to develop the Strom Thurmond Institute of Government and Public Affairs, part of which will contain not only Senator Thurmond’s papers but all of the library’s special collections. As a result of this gift, the Special Collections Unit with its materials will be consolidated in one area, Level 2, and three staff positions have been added to support the additional work load. The library staff began planning for the special collections portion of the Institute building by developing a building program for that portion.

In the fall the library’s endowment received a major monetary gift of more than $96,000 from Joe and Dorothy Shirley in memory of Mr.
Shirley's mother, Callie Jones Shirley. Mr. Shirley graduated from Clemson in 1940. Mr. and Mrs. Shirley thus became the library's first Founding Patrons. The library will begin receiving and using the income from this gift next year.

During the year the library received two gifts from Clemson student groups. Blue Key Tigerama Fund donated $15,000 to purchase the library's Tattle-Tape Book Security System, which provides improved security and reduced security costs. The library's Circulation staff inserted more than 200,000 detection strips in existing holdings, while the Acquisitions staffs stripped all new monographs and bound periodicals and selected current issues of periodicals. Student Government gave $5,600 toward the purchase of a new coin-operated microfilm reader-printer. These gifts were especially helpful in a year in which financial problems abounded.

The library was spared budget cuts made by the University, but inflation reduced buying power for periodical material from $299,000 to $174,552, a 41 percent drop in the amount available for monographic purchasing. The portion of the total library materials budget spent on monographs dropped from 35 to 21 percent, thus hampering the library's ability to support research and teaching by providing monographic materials.

The culprit in this reduction was the inflation of periodical and serial subscription prices, which rose $79,283 in 1981-82 — a 15.6 percent increase. Because the costs of these materials have grown faster than the library can manage with a stable budget, three cancellation programs were formed. The first reduced duplicate subscriptions and duplicate retention in multiple formats; the second freed funds to initiate new subscriptions; the third and largest reduced the total amount spent on subscriptions to offset at least a portion of the anticipated inflation in 1982-83. Over 500 subscriptions will be cancelled to provide funds for non-subscription material. A cut of this magnitude necessarily impairs teaching and research, and any further cuts will have an even more severe impact on academic programs.

The lack of funds for equipment also prevents the upgrading of the microform reading area and expansion of the collections into non-book areas such as films, filmstrips, tapes, phonodiscs, video tapes and discs, etc.

During 1981-82 the library selected two highly qualified librarians for Librarian-in-Charge positions. One of the library's monographic cataloguers was selected for the Librarian-in-Charge position against a national field of candidates.

Overall, 1981-82 was a prosperous year for Cooper Library and its branches, highlighted by the Thurmond, Shirley and student gifts. The diligent efforts of the staff demonstrate a commitment to excellence.
## Statistics

### 1. Collections

<table>
<thead>
<tr>
<th>Volumes Added</th>
<th>Gross</th>
<th>Withdrawn</th>
<th>Net</th>
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<tr>
<td>Cataloged</td>
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<td>2,628</td>
<td>17,302</td>
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<td>US Government Documents</td>
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<td>371</td>
<td>8,494</td>
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<td>USDA</td>
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<tr>
<td>Sirrine</td>
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<td>229</td>
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<tr>
<td>Architecture</td>
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<td></td>
<td>84</td>
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<tr>
<td>Net Added</td>
<td></td>
<td></td>
<td>27,256</td>
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### Holdings

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<tr>
<td>1980/81 (Bound Volumes)</td>
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<tr>
<td>Net Added (Bound Volumes)</td>
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<td>Total (Bound Volumes)</td>
<td>862,422</td>
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<td>Microfilm reels (added 615)</td>
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<td>Microfiche (42,584)</td>
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<td>Microcards (0)</td>
<td>31,508</td>
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<td>Bound Volume Equivalent</td>
<td>118,411</td>
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<td>Grand Total (Bound Volumes and Equivalents)</td>
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### Serial Titles Held

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<td>Serials</td>
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### Serials Subscriptions

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<td>Serials</td>
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### 2. Circulation

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<td>Visitors</td>
<td></td>
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<tr>
<td>Cooper</td>
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<td>Architecture</td>
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56
## Items Circulated

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<th>Section</th>
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<tr>
<td>Items Circulated</td>
<td>184,862</td>
<td>32,886</td>
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## 3. Reference Services

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<tr>
<td>Reference questions</td>
<td>20,382</td>
<td>7,662</td>
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<td>Directional questions</td>
<td>6,645</td>
<td>8,662</td>
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<td>Research questions</td>
<td>197</td>
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<td>197</td>
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<tr>
<td>Total</td>
<td>27,027</td>
<td>15,935</td>
<td>43,548</td>
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## Computer Searches

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<tbody>
<tr>
<td></td>
<td>24</td>
<td>256</td>
<td>280</td>
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## Interlibrary Loans

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<tr>
<td>Loaned</td>
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<td>3,423</td>
<td>4,299</td>
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<tr>
<td>Borrowed</td>
<td>1,344</td>
<td>1,341</td>
<td>2,685</td>
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COMPUTING SERVICES

Computer Center

Considering the substantial data processing demands placed on the Computer Center in 1981-82, a satisfactory level of service was provided to users. However, some additional slowdown in response times must be expected in the fall, prior to installation of a replacement for the IBM 3033.

Growth in computer usage over the past year was somewhat slowed because of the inability of the computer to handle a substantially increased workload. Nevertheless, total on-campus use increased by about one-third. Outside usage also increased, but not as fast as on-campus; so the shift in use from off-campus to on-campus continued. Revenue projections, however, were realized.

New remote terminal sites have been installed in the Cooper Library, the Nursing building, and at Greenville TEC. A number of the remotes are now monitored from a central location by means of TV cameras, thus reducing the expenses of supervision. The center maintains most of the terminals, and now offers maintenance on certain classes of terminals to the general user. This is expected to save the University over $25,000 each year.

The center received a number of major grants, enabling services to be expanded. A major grant from Digital Equipment Corporation of $600,000 facilitated the acquisition of two VAX 11/780 computers, one for computer graphics, the other for research. These machines are to be housed in Riggs Hall, but the necessary renovations have been delayed and no projected completion date is available. DEC also provided partial funding for research projects in word processing and videotex, resulting in the acquisition of a VAX 11/750 computer. Further grants from DEC have included two PDP 11/34 computers which will be housed in the Nursing building. One will be used to run the operating system UNIX, the other as a front-end to the research VAX 11/780. A grant of microprocessor equipment, also from DEC, will be used to supplement the microprocessor laboratory in the College of Engineering, which was set up by an earlier grant of equipment from DEC to the Computer Center. A grant of $350,000 in cash and equipment from IBM was obtained to perform research into computer-aided design. These and a number of other grants and contracts totalled more than $1.25 million for the year.

The Computer Center staff remains relatively stable. However, training for new staff members and re-training for existing staff is becoming increasingly expensive, and it is not possible to provide the staff the kind of professional exposure they have received in the past. Six positions, which are funded totally by CETA, are threatened with elimination. The loss of these positions would be a severe blow to the center’s operations. On
the positive side, the center has received two positions under the University's minority training program. These positions are temporary, but it is hoped they will be made permanent.

The center's major problems remain the same. Operating costs continue to rise at a rate far exceeding the rate of inflation. However, the center's efficiency has more than kept pace, and the cost per unit of output continues to decline. The remaining unsettled problems concern the lack of space and the poor environmental conditions at the Computer Center. Though this problem has been mentioned in previous Annual Reports, it is getting worse. Working conditions at the center adversely affect both people and machines. While the machine room environment might be improved by replacing the computer with a more energy-efficient unit, there are no plans to add space to the center; so the space problem will remain.

Division of Administrative Programming Services

The Division of Administrative Programming Services (DAPS) develops and maintains computerized information systems for the University administration. The division consults with the University departments and helps them design systems to support routine operational needs as well as management decisions. A key ingredient in DAPS' mission is the design coordinated department systems that operate around an integrated University data base. During the 1981-82 fiscal year, in conjunction with major users, DAPS accomplished the following tasks:

1. Installed an alumni data base for on-line update and retrieval of alumni gift information. Most reports are requested from a terminal using automated report request software.
2. Completed the design and programming of a course enrollment system. The system, a major component of the student data base, maintains current and past class enrollment records on all Clemson students.
3. Completed the design and programming of a course data system. This system is also a major component of the courses that could be or have been taught at Clemson.
4. Assisted in the selection of the NOTIS system for installation in the Cooper Library in fiscal 82-83.
5. Implemented a physical plant material tracking system. This system records and tracks the status of purchases planned by the Physical Plant for work orders and plant maintenance.
6. Supported the spring and fall University budget processes by making changes to the existing software as required by changing University and State procedures.
7. Performed the analysis for an on-line departmental encumbrance system.
8. Converted all University administrative systems to new data base management software (IDMS Release 5.5 and IDD Release 2).
9. Fostered the use by administrative staff of data retrieval languages such as CULPRIT and SAS.
10. Converted many computer reports to computer output microfiche (COM) in order to save production and storage costs.
11. Performed the planning and began the implementation of a data security measures for administrative information using the software package RAC-F.
12. Designed and began programming a completely new IPTAY donation processing and information retrieval system.
13. Implemented a new student scheduling system to handle the new class patterns planned for the Fall Semester of 1982.
14. Began design on a system to process gifts from corporate, industrial and professional/trade organizations.
15. Designed and began programming an automated billing/indirect cost charging system for the Grants and Contracts department.
16. Maintained the effectiveness and efficiency of 50 administrative systems and responded to requests for enhancements as prioritized by major users.
17. Assisted in implementing fiscal year-end pay adjustments.
18. Expanded the network of terminals in administrative offices to allow on-line access to certain personnel and accounting records.
19. Updated the University Information System Plan that projects all information systems work to be done over the next three years.
20. Assisted several departments in the selection and installation of word processing equipment.
21. Added to our integrated data dictionary that serves as an inventory of the names and definitions of all University data elements. This dictionary also serves as an inventory and cross reference of all systems, programs, project leaders and data records.
22. Assisted in the implementation of a Physical Plant maintenance management system obtained from Daniel International.
23. Implemented the Graduate School admissions and enrollment system, a major component of the University Student Data Base.

**Division of Information Systems Development**

DISD had a mixed year in 1981-82. While the year was successful from the point of view of revenues, little has been accomplished in identifying major contractors to replace or supplement DSS. The change in administration seems to have been accomplished with no disruption. No full-time staff members have left during the year, and the staff seems very stable. DISD relations with the Computer Center are vastly improved, and the two groups are involved in a number of joint projects.
Revenue for 1981-82 is up more than from the previous year despite the recession. While the level of the DSS contract has not increased, a major new contract was signed with NCR. Unfortunately, the recession may adversely affect that contract for next year. A modest contract with the US Forest Service is being negotiated, with the potential for a larger contract at a later time. DISD and the Computer Center are working jointly on research projects in word processing, videotex, and computer-aided design.

DISD’s overdependence on DSS continues, though there has been some small success in obtaining additional contracts. The future of DISD depends on getting new contracts to reduce the dependency on DSS, but the recession and government cutbacks are hampering attempts to find those contracts. Nevertheless, that will be the major challenge for 1982-83.
ACADEMIC FUND RAISING

Development

Support from business, industry, foundations, and professional and trade organizations reached an all-time high in 1981 of $2,247,609. This total included $483,830 from business and industry and $1,320,868 from foundations. Most of these gifts were designated for a variety of academic programs including professorships, scholarships, fellowships, awards and departmental programs.

Gifts of equipment exceeded $333,000. Endowment gifts amounted to $490,000 and were restricted to endowed chairs, fellowships, scholarships, awards and The Robert Cook Edwards Endowment for Excellence in Science and Technology. Funds for special activities like the minority recruitment program in engineering were also received.

Gifts to assist students with the cost of their education and to recognize academic excellence totaled more than $390,000.

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

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

Clemson University Foundation

The Clemson University Foundation is the organization designated by the Board of Trustees to accept and administer all endowments for Clemson University. It is a non-profit organization which has 25 directors who oversee its activities. There are nine working committees: Deferred Gifts, Business and Corporate, Foundations, Investment, Agricultural, Commerce and Industry, Engineering, Forest and Recreation Resources and Liberal Arts.

Alumni Relations and Resources Development

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

Throughout its history, Clemson University has commanded healthy respect from its contemporaries for the loyalty of its alumni and the dedication of parents, faculty, staff and friends. Harnessing this enthusiasm and guiding it through transition to resources that benefit Clemson’s educational program at every level has led to new interest, involvement and support from private sources.
One of the annual fund’s first commitments is to those classroom professors whose work at the undergraduate level provides the solid foundation on which serious students can build an education that will prepare them to face the challenge of the ’80s. Unrestricted gifts help attract and keep high quality faculty through alumni professorships and recognition of master teachers; two new awards this year also recognize individuals for achievement in the fields of research and public service.

Five new alumni professors were selected by the provost and academic deans, bringing the total number of alumni professors to fifteen. Classroom expertise is the primary prerequisite, and each receives an annual stipend of $3,000.

Equally important is student scholastic achievement. The prestigious Robert Franklin Poole Alumni Scholarships recognize top high school achievers from across the nation. These 21 renewable scholarships each have a value of $12,000. University alumni scholarships help Clemson compete favorably with other great universities for the nation’s best high school talent. And the alumni presidential scholarships attract hundreds of freshmen to Clemson. Annual fund gifts by campus participants recognize faculty-staff scholars and help with other academic scholarships programs. The Parents Fund and gifts from the University’s friends add other support to the recognition of distinguished students and outstanding teachers. These grants totaled $1.7 million in 1981.

All annual giving — the Alumni Loyalty Fund, the Faculty-Staff Loyalty Fund, the Parents’ Fund, giving by friends, and the corporate and business matching grants program — is consolidated in a single department, which also has responsibility for long-range accumulation of assets through deferred giving and estate planning.

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

• Upgrading levels of giving to the annual fund.
• Continuing a “town and gown” program with the Chamber of Commerce.
• Contributing to the functioning of the President’s Advisory Group (all advisers are alumni).
• Reorganizing Clemson Clubs throughout the country.
• Coordinating the Clemson Medallion Ceremony during Founder’s Week.
• Refining computer requirements for the development by DAPS of on-line systems.

In addition, members of the staff are serving on the campus Master Planning Committee, the University Self-Study Committee and the Computer Advisory Committee.
STUDENTS

The 1981-82 academic year marked Clemson’s highest on-campus enrollment with 11,291 students registered for classes (10,249 full-time and 1,042 part-time). An additional 635 were in various off-campus programs bringing the total enrollment to 11,926 — a record high for the University. Of the total enrollment, 2,008 were graduate students.

The College of Engineering was again number one in on-campus enrollment in 1981-82 with 3,030 students enrolled. The College of Commerce and Industry, a close second with 2,652 students enrolled, was followed in order by Sciences, Education, Agricultural Sciences, Liberal Arts, Architecture, Forest and Recreation Resources, and Nursing. Architecture, Engineering, Commerce and Industry, and Sciences had enrollment increases. All other colleges experienced some decrease in enrollment.

Opportunities for higher education continued to become increasingly accessible as evidenced by the increased number of freshmen entering college with advanced standing. In the 1981-82 fall semester, 502 new high school graduates entered Clemson with advanced standing by means of College Board Advanced Placement courses (268), concurrent enrollment in high school and college (107), enrollment in summer school (Clemson 87, other institutions 92), and departmental examinations (9).

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 42 percent of the freshman class entering in the fall of 1981 ranked in the top 10 percent of their class; 70 percent in the top 20 percent; and 95 percent in the top 50 percent. Much publicity has been given to the decline in the past decade of SAT scores. In contrast, the average SAT score of freshmen at Clemson has changed very little during the period of decline. In 1981 the freshmen class average of 1007 compared with an average of 896 reported by College Board for all high school seniors. It is also the highest average among state-supported institutions in South Carolina.

Of the 7,918 new applications for admissions processed for 1981-82, 4,698 were accepted and 2,789 actually enrolled (including freshmen and transfer students). South Carolina residents accounted for 80 percent of the 11,926 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, Virgin Islands, Guam and 55 foreign countries (240 students).

Greenville county continued to be the top county with 1,241 students enrolled on campus. Pickens county was second with 877 students enrolled followed in order by Anderson, Charleston, Spartanburg, and Oconee counties. Most out-of-state students came from the contiguous states of North Carolina (513) and Georgia (507), and from Florida (360).
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

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<th>Year</th>
<th>Undergraduate</th>
<th>Graduate and Others</th>
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<td>7,300</td>
<td>1,590</td>
<td>8,890</td>
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<tr>
<td>1972-73</td>
<td>7,686</td>
<td>2,071</td>
<td>9,757</td>
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<tr>
<td>1973-74</td>
<td>7,910</td>
<td>2,204</td>
<td>10,112</td>
</tr>
<tr>
<td>1974-75</td>
<td>8,171</td>
<td>2,415</td>
<td>10,586</td>
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<tr>
<td>1975-76</td>
<td>8,576</td>
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<td>1976-77</td>
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<tr>
<td>1977-78</td>
<td>8,708</td>
<td>2,566</td>
<td>11,274</td>
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<td>1978-79</td>
<td>8,925</td>
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<td>9,427</td>
<td>2,152</td>
<td>11,579</td>
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<tr>
<td>1981-82</td>
<td>9,918</td>
<td>2,008</td>
<td>11,926</td>
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</table>

The 1981-82 figures include 402 students attending off-campus institutes and 186 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 1981 fall semester. There were 4,860 of which 3,960 were undergraduates. Enrollment of undergraduate coeds increased 6.3 percent over the previous year. Women now constitute more than 39 percent of on-campus enrollment and about 41 percent of the total enrollment.

The Clemson student body continues to be a working group receiving a significant amount of financial assistance in the forms of loans, grants, scholarships and work assistance. In 1981-82 approximately 3,375 students earned an estimated $5,529,657 working for the University. This figure does not include earnings from off-campus employment. Clemson awarded 263 long-term loans totaling $347,637. The University also approved and certified 2,500 guaranteed student loans from a variety of lending institutions. Excluding donor-selected scholarships, 390 scholarships and grants, valued at $390,923 were awarded. The number of students receiving Pell Grants was 1,613, with awards totaling $1,592,952. In all, an estimated 65 percent of the student body received financial assistance administered by Clemson.

Student organizations on the Clemson campus offer opportunities for personal development beyond the classroom experience. Members of organizations participate in organizational leadership development, program planning and policy development. They represent Clemson at
various conventions and competitions throughout the nation. In 1981-82, the 226 organizations initiated 35 projects (25 organizations) for local and national charities and sponsored 93 projects (63 organizations) for organizational gain.

The Student Government has continued to profit from strong, capable, creative and dedicated leadership. This past year approximately $5,800 in profit was made from the sales of orange and white shoes, donated by a company in Columbia. A new escort program is being implemented to aid in the safety and security of female students.

The first Blue Light Blitz was successfully completed by the Sports Car Club and the University Alcohol Committee. This demonstration program focused on the effects of drinking and driving.

The Clemson Tour Guide program continues to grow and be an excellent public relations program. From this the Clemson Ambassador program was developed. These selected students worked at all orientations and continue to be available for VIP events, tours and programs. These students represent a wide cross-section of students, yet are received as the "cream of the crop." Orientation continues to be a positive program and the Ambassadors have helped make it so.

Student media organizations have proven to be effective outlets for student opinion and creativity. "TAPS" was awarded the Best Yearbook in South Carolina by the South Carolina Press Association (SCPA) and was given first place by the Associated Collegiate Press and second place by the Scholastic Press Association. "The Tiger," Clemson's weekly newspaper, celebrated its 75th anniversary and was chosen as the best collegiate newspaper in the State. WSBF, the campus radio station, will increase its power output from 10 to 1,000 watts this fall.

Clemson's sororities continue to grow in size and popularity. Sororities have an average of 115 members and the campus total include 28 percent of the undergraduate women at Clemson. The grade point average for all sorority women is 2.83. The total raised in philanthropic events was $15,000. The 16 fraternities comprise approximately 13 percent of all undergraduate males.

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, 1981 through May 7, 1982, 9,540 student parking decals were issued and $5,420 was deposited to the Miscellaneous Income Account (MIA). The Department of Public Safety officers wrote 36,900 parking tickets during the same period. The total amount of parking fines collected at the Traffic Office and deposited to the MIA was $26,825, while $126,381 was turned over to the Accounting Office for collections. The Student Traffic Review Board heard appeals for 1,112 students involving 1,325 parking tickets or about 3.5 percent of the tickets written.
In the area of returned checks, 1,482 student checks were returned to the Student Life and Traffic Office. Approximately 93 percent of the $117,069.50 from returned checks was collected.

Career Services, which is composed of Placement and Cooperative Education, felt the effects of the recession. Most employers reduced the number of job offers to seniors, and some, faced with laying off professionals, were forced to spend their co-op program or cut back on the number of students employed.

There were 1,208 seniors and 100 juniors registered with the Placement Office for help in finding full-time employment or a summer internship, and 410 undergraduates were looking for part-time work. The office coordinated the visits of 275 employers in the fall and 226 in the spring with 70 employers cancelling scheduled visits. The number of interviews was 7,960 which is almost the same as last year, but there were only 390 offers reported, compared to 709 reported during the 1980-81 recruiting season. Salaries by academic major were up from six to 12 percent for an average increase of approximately 10 percent over last year.

A few employers were forced to discontinue their cooperative education program during the year, and many others reluctantly postponed hiring replacements for students finishing their work periods. Despite the unfavorable economic situation, Cooperative Education experienced a modest 10 percent increase in the total number of students involved in the program, rising from 360 last year to 396 this year. Collectively, Clemson’s Cooperative Education students earned over $1.7 million for the academic year. When the economy improves, the Cooperative Education program should experience a rapid growth.

The Clemson University Union, through its 11 student committees and its 250 volunteers, provided 1,200 different social, cultural and recreational programs, with an aggregate attendance of 120,000 during the 1981-82 school year.

In addition, thousands of students took advantage of Union facilities including the game room, night club, TV lounges, coffeehouse, art gallery and video theater.

In 1981-82 nine Clemson athletic teams finished in the top 20 in the nation. Twenty-six athletes made All-American in 14 different sports, and 60 athletes were named All-Conference in 13 different sports.

Additionally, Clemson won four ACC titles, giving the Tigers 17 conference crowns in eight different sports over the past four seasons. No sport at Clemson had a losing record, and the overall winning percentage was .661.

Clemson won its first national championship as the 1981 football team defeated Nebraska 22-15 in the Orange Bowl on January 1, 1982 to post a 12-0-0 record. The Tigers were declared national champions by Associated Press and United Press International.
For the first time in Clemson history individuals were named as national coach of the year. They were as follows:

* Charles (Chuck) Kriese — National Tennis Coach of the Year
* Danny L. Ford — National Football Coach of the Year
* Charlie Poteat — National Fencing Coach of the Year
* George W. Dostal — National Strength and Conditioning Coach of the Year.
### 1981-82 Clemson Athletics Review

<table>
<thead>
<tr>
<th>Sport</th>
<th>Home</th>
<th>Away</th>
<th>Neutral</th>
<th>ACC</th>
<th>Overall Record</th>
<th>ACC Reg Season</th>
<th>ACC Trn Finish</th>
<th>National Ranking</th>
<th>All-ACC Players</th>
<th>All-Americans</th>
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<td>6-0</td>
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<td>4-1</td>
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<td>1-0</td>
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<td>1st (T)</td>
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<td>1.000</td>
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<td>Sixth</td>
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<td>---</td>
<td>---</td>
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</tr>
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<td>*Golf</td>
<td>---</td>
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<td>---</td>
<td>---</td>
<td>First</td>
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**MEN'S TOTALS**

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<th>ACC</th>
<th>Overall Record</th>
<th>ACC Reg Season</th>
<th>ACC Trn Finish</th>
<th>National Ranking</th>
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<th>All-Americans</th>
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<tr>
<td></td>
<td>81-16</td>
<td>40-34</td>
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<td></td>
<td>(.835)</td>
<td>(.541)</td>
<td>(.722)</td>
<td>(.696)</td>
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<td>(.704)</td>
<td>(.536)</td>
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**WOMEN'S TOTALS**

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<th>ACC Reg Season</th>
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<th>All-Americans</th>
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<tr>
<td></td>
<td>31-13</td>
<td>19-17</td>
<td>46-35</td>
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<td>96-65</td>
<td>.596</td>
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<td>2 Top 20</td>
<td>20</td>
<td>7</td>
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<tr>
<td></td>
<td>(.705)</td>
<td>(.528)</td>
<td>(.568)</td>
<td>(.615)</td>
<td>(.671)</td>
<td>(.794)</td>
<td>(.536)</td>
<td>(.615)</td>
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**OVERALL TOTALS**

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<th>Overall Record</th>
<th>ACC Reg Season</th>
<th>ACC Trn Finish</th>
<th>National Ranking</th>
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<th>All-Americans</th>
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<tbody>
<tr>
<td></td>
<td>112-29</td>
<td>59-51</td>
<td>72-45</td>
<td>55-27</td>
<td>243-125</td>
<td>.661</td>
<td>4 Firsts</td>
<td>9 Top 20</td>
<td>60</td>
<td>26</td>
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<tr>
<td></td>
<td>(.794)</td>
<td>(.536)</td>
<td>(.615)</td>
<td>(.671)</td>
<td>(.615)</td>
<td>(.794)</td>
<td>(.536)</td>
<td>(.615)</td>
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</table>

* Denotes advancement to postseason play as a team or individual.

Officially, Clemson claimed six ACC Championships: Football, cross country, women's tennis, soccer, golf and track (tie).
### 1981-82 Individual Honors

<table>
<thead>
<tr>
<th>Sport</th>
<th>All-Atlantic Coast Conference</th>
<th>All-American</th>
</tr>
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<tbody>
<tr>
<td>Football</td>
<td>Homer Jordan, Terry Kinard, Tony Berryhill, Dan Benish, Perry Tuttle, Lee Nanny, Jeff Davis, Jeff Bryant</td>
<td>Jeff Davis, Perry Tuttle, Lee Nanny, Jeff Bryant</td>
</tr>
<tr>
<td>Baseball</td>
<td>Jeff Gilbert, Jimmy Key</td>
<td>Nnamdi Nwokocha</td>
</tr>
<tr>
<td>Soccer</td>
<td>Nnamdi Nwokocha, Adubarie Otorubio</td>
<td>Nnamdi Nwokocha</td>
</tr>
<tr>
<td>Men’s Tennis</td>
<td>Rick Rudeen, Mark Dickson, Jean Desdunes, Greg Cooper</td>
<td>Mark Dickson, Jean Desdunes</td>
</tr>
<tr>
<td>Golf</td>
<td>Julian Taylor, Dillard Pruitt</td>
<td></td>
</tr>
<tr>
<td>Wrestling</td>
<td>Todd Sterr</td>
<td></td>
</tr>
<tr>
<td>Women’s Swimming</td>
<td>Coy Cobb, Neil Brophy, Keith Emery, Ed Jolley, Steve Shine, David Upp, Mark Bertz, Scott Newkirk, Mike Zimmerman, Mike Labonge</td>
<td>Neil Brophy, Coy Cobb, Mark Bertz, Keith Emery, Chip McElhatten</td>
</tr>
<tr>
<td>Women’s Swimming</td>
<td>Dana Zonnevylle, Callie Emery, Sue Ball, Debbie Daigneault, Cappy Craig, Nancy Wellish, Trish Parker, Rebecca Kitchen, Terry Bond, Karen Armel, Robin Zubeck, Cindy Peters</td>
<td>Cappy Craig</td>
</tr>
<tr>
<td>Men’s Fencing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men’s Indoor Track</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men’s Cross Country</td>
<td>Jim Haughey, Hans Koeleman, Julius Ogaro</td>
<td>Jim Haughey</td>
</tr>
<tr>
<td>Men’s Outdoor Track</td>
<td>Mike Hartle, Jack Harkness, Hans Koeleman, Jim Haughey, Chuck McSwain, Rod McSwain, Terence Toatley, Joe Varn</td>
<td>Mike Hartle, Jack Harkness, Jim Haughey</td>
</tr>
<tr>
<td>Women’s Cross Country</td>
<td>Kerry Robinson, Cindy Duarte</td>
<td>Kerry Robinson, Cindy Duarte</td>
</tr>
<tr>
<td>Women’s Outdoor Track</td>
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<td></td>
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</tbody>
</table>
Women's
Basketball . . . Barbara Kennedy, Mary Anne Cubelic

Women's
Tennis . . . . Jane Forman, Jody Trucks,
Melissa Seigler, Lori Miller

Field Hockey . . . Barbie Johnson

Atlantic Coast Conference Most Valuable Players
Julius Ogaro, Men's Cross Country
Hans Koeleman, Men's Outdoor Track
Tod Sterr, Wrestling
Jeff Davis, Football
Barbara Kennedy, Women's Basketball

National Player of the Year
Mark Dickson, Men's Tennis
Barbara Kennedy, Women's Basketball

National Coach of the Year
Danny Ford, Football
Charlie Poteat, Men's Fencing
George Dostal, Men's Strength
### Fall Semester 1981 Enrollment by Colleges, and Degrees Awarded
December 1980-August 1981

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<th>Enrollment</th>
<th>Degrees</th>
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<td>Non-Degree</td>
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<td><strong>TOTALS</strong></td>
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Degrees awarded since 1896 (through August 1981) total 47,036 of which 416 have been associate degrees; 38,198 bachelor's degrees; 7,730 master's degrees; 93 education specialist degrees; and 599 doctorates.
### Number and Percent of Black Students

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<th>Year</th>
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<th>Percent</th>
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<td>1980</td>
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<td>1981</td>
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### Student-Faculty Ratio (Full-Time Equivalent)

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<tr>
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### Average College Board Score of Freshmen

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<td>Year</td>
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</tr>
<tr>
<td>1971</td>
<td>508.1</td>
</tr>
<tr>
<td>1972</td>
<td>614.8</td>
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<td>1973</td>
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<td>1974</td>
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</tr>
<tr>
<td>1975</td>
<td>602.5</td>
</tr>
<tr>
<td>1976</td>
<td>611.3</td>
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<td>1977</td>
<td>654.4</td>
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<td>1978</td>
<td>675.6</td>
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<tr>
<td>1979</td>
<td>691.8</td>
</tr>
<tr>
<td>1980</td>
<td>718.2</td>
</tr>
<tr>
<td>1981</td>
<td>709.7</td>
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</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
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<tbody>
<tr>
<td>1971</td>
<td>1,853</td>
</tr>
<tr>
<td>1972</td>
<td>1,919</td>
</tr>
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<td>1973</td>
<td>2,034</td>
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<td>1974</td>
<td>1,949</td>
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<td>1975</td>
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<td>1977</td>
<td>1,838</td>
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<td>1978</td>
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<td>1979</td>
<td>1,998</td>
</tr>
<tr>
<td>1980</td>
<td>2,008</td>
</tr>
<tr>
<td>1981</td>
<td>2,284</td>
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### Number of On-Campus Students in Summer School

<table>
<thead>
<tr>
<th>Year</th>
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<tbody>
<tr>
<td>1971</td>
<td>4,692</td>
</tr>
<tr>
<td>1972</td>
<td>5,232</td>
</tr>
<tr>
<td>1973</td>
<td>6,276</td>
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<td>1974</td>
<td>5,997</td>
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<td>1975</td>
<td>6,275</td>
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<td>1976</td>
<td>6,100</td>
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<tr>
<td>1977</td>
<td>6,301</td>
</tr>
<tr>
<td>1978</td>
<td>6,393</td>
</tr>
<tr>
<td>1979</td>
<td>6,708</td>
</tr>
<tr>
<td>1980</td>
<td>6,858</td>
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<tr>
<td>1981</td>
<td>6,897</td>
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### Acceptance Rates of Applicants

<table>
<thead>
<tr>
<th>Year</th>
<th>Rate</th>
</tr>
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<tbody>
<tr>
<td>1971</td>
<td>87%</td>
</tr>
<tr>
<td>1972</td>
<td>83%</td>
</tr>
<tr>
<td>1973</td>
<td>83%</td>
</tr>
<tr>
<td>1974</td>
<td>84%</td>
</tr>
<tr>
<td>1975</td>
<td>77%</td>
</tr>
<tr>
<td>1976</td>
<td>69%</td>
</tr>
<tr>
<td>1977</td>
<td>69%</td>
</tr>
<tr>
<td>1978</td>
<td>69%</td>
</tr>
<tr>
<td>1979</td>
<td>60%</td>
</tr>
<tr>
<td>1980</td>
<td>59%</td>
</tr>
<tr>
<td>1981</td>
<td>59%</td>
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</table>
## Retention Rate of Students
(Freshman Class)

<table>
<thead>
<tr>
<th>Year</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>78%</td>
</tr>
<tr>
<td>1971</td>
<td>84%</td>
</tr>
<tr>
<td>1972</td>
<td>82%</td>
</tr>
<tr>
<td>1973</td>
<td>83%</td>
</tr>
<tr>
<td>1974</td>
<td>84%</td>
</tr>
<tr>
<td>1975</td>
<td>82%</td>
</tr>
<tr>
<td>1976</td>
<td>84%</td>
</tr>
<tr>
<td>1977</td>
<td>84%</td>
</tr>
<tr>
<td>1978</td>
<td>87%</td>
</tr>
<tr>
<td>1979</td>
<td>87%</td>
</tr>
<tr>
<td>1980</td>
<td>87%</td>
</tr>
</tbody>
</table>

## Number of Dorm Beds and Percent Being Used

<table>
<thead>
<tr>
<th>Year</th>
<th>Beds</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>5,190</td>
<td>93</td>
</tr>
<tr>
<td>1971</td>
<td>5,174</td>
<td>97</td>
</tr>
<tr>
<td>1972</td>
<td>5,330</td>
<td>100</td>
</tr>
<tr>
<td>1973</td>
<td>5,392*</td>
<td>101</td>
</tr>
<tr>
<td>1974</td>
<td>5,616*</td>
<td>103</td>
</tr>
<tr>
<td>1975</td>
<td>5,625*</td>
<td>103</td>
</tr>
<tr>
<td>1976</td>
<td>5,662*</td>
<td>103</td>
</tr>
<tr>
<td>1977</td>
<td>5,683*</td>
<td>104</td>
</tr>
<tr>
<td>1978</td>
<td>5,726*</td>
<td>106</td>
</tr>
<tr>
<td>1979</td>
<td>6,317*</td>
<td>112</td>
</tr>
<tr>
<td>1980</td>
<td>6,864*</td>
<td>103**</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

** Due to construction in Calhoun Courts, 160 of the 512 beds were used. (The 6,864 figure includes 512 beds.)
CURRENT OPERATING FUNDS
Revenues and Additions by Source

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Fees</td>
<td>$16,118,426</td>
<td>11.59%</td>
</tr>
<tr>
<td>State Appropriations:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational and General</td>
<td>$41,601,860</td>
<td>29.91%</td>
</tr>
<tr>
<td>Agricultural Research and Public Service</td>
<td>$23,933,889</td>
<td>17.21%</td>
</tr>
<tr>
<td>Federal Appropriations:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural Research and Public Service</td>
<td>$9,888,861</td>
<td>7.11%</td>
</tr>
<tr>
<td>Local Appropriations:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agricultural Research and Public Service</td>
<td>$4,477</td>
<td>-</td>
</tr>
<tr>
<td>Sales and Services of Educational Departments</td>
<td>$1,485,564</td>
<td>1.07%</td>
</tr>
<tr>
<td>Miscellaneous Sources</td>
<td>$4,644,692</td>
<td>3.34%</td>
</tr>
<tr>
<td>Endowment Income</td>
<td>$317,405</td>
<td>0.23%</td>
</tr>
<tr>
<td>Investment Income</td>
<td>$1,015,100</td>
<td>0.73%</td>
</tr>
<tr>
<td>Sales and Services of Auxiliary Enterprises</td>
<td>$23,288,694</td>
<td>16.74%</td>
</tr>
<tr>
<td>Federal Grants and Contracts</td>
<td>$6,674,261</td>
<td>4.80%</td>
</tr>
<tr>
<td>State Grants and Contracts</td>
<td>$657,095</td>
<td>0.47%</td>
</tr>
<tr>
<td>Local Grants and Contracts</td>
<td>$33,079</td>
<td>0.02%</td>
</tr>
<tr>
<td>Private Gifts, Grants and Contracts</td>
<td>$9,434,565</td>
<td>6.78%</td>
</tr>
<tr>
<td><strong>TOTAL REVENUES AND ADDITIONS</strong></td>
<td><strong>$139,097,968</strong></td>
<td><strong>100.00%</strong></td>
</tr>
</tbody>
</table>

Brought Forward from 1980-81 for:

<table>
<thead>
<tr>
<th>Source</th>
<th>Amount</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encumbrances and Restricted Funds Balance</td>
<td>$11,080,198</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL FUNDS AVAILABLE</strong></td>
<td><strong>$150,178,166</strong></td>
<td></td>
</tr>
</tbody>
</table>

Expenditures by Function

<table>
<thead>
<tr>
<th>Function</th>
<th>Amount</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instruction</td>
<td>$34,437,196</td>
<td>26.43%</td>
</tr>
<tr>
<td>Research — Departmental</td>
<td>$7,595,212</td>
<td>5.83%</td>
</tr>
<tr>
<td>Research — Agricultural Experiment Station</td>
<td>$13,457,003</td>
<td>10.33%</td>
</tr>
<tr>
<td>Extension and Public Service</td>
<td>$1,552,514</td>
<td>1.19%</td>
</tr>
<tr>
<td>Extension and Public Service — Cooperative</td>
<td>$18,996,133</td>
<td>14.58%</td>
</tr>
<tr>
<td>Extension and Public Service — Regulatory Service</td>
<td>$3,806,945</td>
<td>2.92%</td>
</tr>
<tr>
<td>Academic Support</td>
<td>$6,305,807</td>
<td>4.84%</td>
</tr>
<tr>
<td>Student Services</td>
<td>$3,536,040</td>
<td>2.71%</td>
</tr>
<tr>
<td>Institutional Support</td>
<td>$8,584,765</td>
<td>6.59%</td>
</tr>
<tr>
<td>Operation and Maintenance of Plant</td>
<td>$8,726,125</td>
<td>6.70%</td>
</tr>
<tr>
<td>Auxiliary Enterprises</td>
<td>$21,208,056</td>
<td>16.28%</td>
</tr>
<tr>
<td>Scholarships and Fellowships</td>
<td>$2,086,291</td>
<td>1.60%</td>
</tr>
<tr>
<td><strong>TOTAL EXPENDITURES</strong></td>
<td><strong>$130,292,087</strong></td>
<td><strong>100.00%</strong></td>
</tr>
<tr>
<td>Transfers and Other Deductions</td>
<td>$4,564,199</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL EXPENDITURES, TRANSFERS AND OTHER DEDUCTIONS</strong></td>
<td><strong>$134,856,286</strong></td>
<td></td>
</tr>
</tbody>
</table>

Balance 6/30/82 for Encumbrances and Restricted Funds Balance | $15,321,880

**TOTAL EXPENDITURES & BALANCE** | **$150,178,166**
Scholarships & Student Aid and Loan Funds  
Fiscal Year 1982

**Revenue**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>Interest on Loans</td>
<td>$ 17,854.31</td>
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<tr>
<td>Gifts, Grants and Contracts</td>
<td>4,305,751.04</td>
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<tr>
<td>Endowment Income</td>
<td>260,866.45</td>
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<tr>
<td>Investment Income</td>
<td>899,609.80</td>
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<tr>
<td>Other Income</td>
<td>4,297.86</td>
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<td><strong>TOTAL</strong></td>
<td><strong>$5,488,379.46</strong></td>
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**Disbursements**

<table>
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<th>Description</th>
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<tbody>
<tr>
<td>Educational Loans</td>
<td>$ 241,296.96</td>
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<tr>
<td>Grants for Scholarships and Fellowships (Including Grants-in-Aid)</td>
<td>2,074,291.25</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$2,315,588.21</strong></td>
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</table>
PUBLIC SERVICE PROGRAMS OF THE COLLEGE OF AGRICULTURAL SCIENCES

Luther P. Anderson, Dean

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

SOUTH CAROLINA AGRICULTURAL EXPERIMENT STATION

W. Cecil Godley, Director

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

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

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

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

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

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

Highlights and Accomplishments

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

Economists and sociologists are investigating means to develop human and natural resources in South Carolina.

Marketing-production economists have analyzed the economic status of the State's industry, using a computer-processed farm business records service provided to dairy farmers. This analysis was done by size of herd and for different breed types. The estimated cost of producing milk for all 35 farms participating in the program was $20.49 per hundredweight, while the average blend price received was $15.81. The results of this analysis are used by the S. C. Dairy Commission to set milk prices. Researchers in marketing-production economics are recommending alternative financing arrangements for farms under risk and uncertainty, and others are suggesting the economically optimum time to replace trees in peach orchards, based on yields, tree loss and discount rates.

Regional economists have devised an econometric test of the "product cycle" theory of industrial location using changes in employment and capital investment in manufacturing. The results show that most new industry coming to South Carolina is "mature," using manufacturing processes developed and tested in other parts of the country and producing products for which marketing systems are already well established. It is the type of industry that uses the moderate level of skills found in the State's labor force, but not the kind of industry that pays high wages. The researchers question South Carolina's ability to compete for industrial investment of this type when Third World countries enter the competition.

Resource economists studied the additional costs to developers if "prime" agricultural lands were reserved exclusively for crop production. In Anderson County, it was concluded that reserving "prime" lands for agriculture would increase the costs of accommodating projected non-agricultural development by seven-14 percent by the year 2000. Resource economists also used input-output and linear programming methods to estimate the marginal value of water in alternative uses in the Santee-Lynches area of South Carolina. They found that during water shortages, the greatest economic benefits are obtained by using that water for soybean production. Moreover, even if water is in short supply in the region, there are strong economic justifications for seeing that soybean and grain production receive access to the available water. Irrigated agriculture, however, cannot compete effectively with manufacturing in periods of water shortage if the objective is to maximize the Gross Regional Product.

Demographic research determined that the population of South Carolina increased slightly more than half a million from 1970 to 1980, with most of the increase in urban and metropolitan categories. There are just under 1.5 million rural inhabitants in the state. Social survey research, administered to South Carolina farmers, indicates that second occupa-
tions (in addition to farming) by one or more members of the household are long-term income sources and considered essential. While many such arrangements are on small farms, all sizes of farm operations are subject to second occupations by members of the households. Social survey research in Sumter County determined that residents of the city of Sumter were likely to favor anti-pollution laws and preservation of open space, but were less willing to assume economic burdens of such regulation. Rural residents of the county favored agricultural land preservation policy if they weren’t to be liable for implementation costs.

Agricultural Engineering

Agricultural engineers carried out major research programs in energy, mechanization and irrigation.

A cordwood gasifier which produces about one million BTUs of heat per hour was tested on a tobacco farm for four weeks. Energy efficiencies of 70 to 80 percent were attained. Development continues to improve wood feeding and control systems.

A portable ethanol production unit was tested using corn, sweet potatoes, sweet sorghum, Jerusalem artichokes, apples and turnips as feedstocks. The unit also was demonstrated at several locations around the State.

The use of waste heat from electrical generating plants for greenhouse heating is being studied in cooperation with the S. C. Public Service Authority. Acceptable temperature control in the greenhouse was obtained when warmed water from the plant was near 85° F.

A tractor-mounted computer records and processes field data to determine energy requirements for disking, subsoiling and other tillage operations. Tillage energy requirements have been found to increase rapidly as subsoiling depth increases. Benefits from very deep subsoiling may not be sufficient to offset the increased energy costs.

Mechanization of fruit, vegetables and aquacultural systems has received major emphasis. A vegetable harvesting aid was modified to improve its overall performance and tested on an okra crop.

A new mechanized production system for fresh market peaches uses a high density planting (meadow orchard). The entire above-ground portion of the tree is cut at harvest each year and the fruit removed. Several shaker designs have been tested for removing fruit. Results indicate no more fruit damage from mechanical harvesting than from conventional hand harvesting.

A new vessel was constructed to transport the mechanical oyster harvester. The harvester has performed satisfactorily and has been used for two seasons to remove oysters from polluted waters for transplanting to cleaner areas.

Studies have concentrated on the efficient use of water and energy in the rapidly expanding practice of irrigation in the State. A comparison of
subsurface and center-pivot sprinkler systems showed a decided eco-
nomic advantage for the subsurface system.

Trickle irrigation is being applied to peaches, pecans and apples at two
locations. Variables being studied are amount of water applied, timing
and frequency of application, number of emitters per tree, application of
pesticides and nutrients through the system, and the economics of the
system.

An irrigation scheduling model programmed for a personal computer
takes into account solar radiation, maximum and minimum temperature,
amount of irrigation or rain, and five-day forecasts. Corn yields were
slightly higher using this system when compared to irrigation based on
tensiometer readings.

A three-year study indicated that corn and soybean yields were not
increased by deep tillage when crops were irrigated. This points to
possible substantial energy savings in tillage practices under irrigation.

An investigation of the role of soil moisture conditions in the peach tree
short life syndrome was initiated. Attention is being given to the possible
roles of soil moisture deficiency during the growing season, and soil
moisture excess during winter and early spring.

Agronomy and Soils

Each year agronomic research is planned statewide to obtain data
growers can use to select crop varieties and develop management prac-
tices, including fertilizer use and weed control chemicals.

Research trials have demonstrated that two new herbicides, Poast® and
Fusilade®, have given consistent and highly selective control of both
annual and perennial grasses in cotton and soybeans under a wide range of
weed growth stages and environmental conditions. When fully registered,
these herbicides will provide growers with a new option in the control of
bermudagrass, johnsongrass, and all annual grasses.

Crop rotation and minimum tillage and their effects on corn and
soybean yields, weed ecology, crop residue amounts, and various soil
parameters were studied for three years (1979-1981) at the Edisto Experi-
ment Station on Dothan soils. Both crops planted in old crop stubble and
rye mulch yielded the same as with conventional clean tillage. Rotation
schemes had little effect on yield, but significantly affected weed ecology.
For example, perennials such as bermudagrass and johnsongrass, and
broadleaf weed species such as sicklepod and morningglory, were worse
in minimum tilled soybeans not rotated with corn. Soil fertility, organic
matter, and bulk density parameters were not affected by tillage or
rotation. Crop residue amounts, however, were significantly greater for
both corn and soybeans planted with minimum tillage.

Efforts continue to delineate the relationships between soybean culti-
vars and rhizobia, and soybean cultivars and mycorrhizae. Many native
rhizobia nodules do not react with the available antisera for serological
identification of the rhizobial strains. A goal of this research is to find rhizobia that make soybeans more efficient for fixing atmospheric nitrogen.

Monitoring rainfall over several years shows that 50 to 60 pounds of limestone per acre are needed annually to neutralize acid to allow maximum plant growth. Acid rain occurs when sulfur dioxide and nitrogen oxide — two gases created from coal and oil furnaces and automobile exhausts — react with vapor and become sulfuric and nitric acids. Since sulfur and nitrogen are two essential nutrients for plants, moderately acid rain is beneficial for most economic plants.

Redhill, a new awnless barley variety, was recently released, and limited seed will be available for the 1983 crop. It is an early variety well suited for double cropping with soybeans and grain sorghums.

Progress in cool-season grass breeding continues. The release of two intermediate wheatgrass germplasms provides sources of material with adaptation to the southeastern U. S. and with improved heat-drought tolerance.

Variety testing of soybeans, tobacco, corn, cotton, peanuts, the small grains, grain sorghum, sunflowers and alfalfa was conducted for yield potential and adaptation in the State. Recent studies indicate alfalfa has potential in the Piedmont as a profitable crop.

Animal Science

The major objective of the animal science program is to find solutions to problems that affect the efficiency of livestock production.

Early weaning of pigs has become popular because it allows greater yearly productivity from the sow herd. However, the resulting three-to-four-week-old pig is very sensitive to diet, disease and temperature. Our most successful diet for this age pig has been a 20 percent crude protein, corn-soybean meal-based diet containing added fat, lysine, calcium and phosphorous. Intermingling litters post-weaning has had no harmful effects on productivity versus rearing pigs as littermates. As numbers of pigs/pen is increased from eight to 16 to 24, performance is generally reduced. In all trials, death loss and scouring have been extremely low.

Research continues on forage-cattle systems to develop year-round grazing systems for growing fall-weaned calves to or near to slaughter weights before the next calf crop is weaned. These systems involve numerous forages, (fescue-clover, rye-crimson clover, rye-arrowleaf clover, coastal bermudagrass, Tifton-44 bermudagrass, sorghum sudangrass, Tifleaf millet, and bermudagrass sods overseeded with rye and crimson clover). The various forages make up components of the numerous systems. By increasing our stocker cattle production rather than selling weanling calves, State agricultural income could increase considerably. Also, ammoniation of forages is being studied to improve
forage quality and storage, and to develop techniques to reduce harvesting losses.

Cows may be allowed to lose weight after calving, provided feed intake and weight gain are increased before breeding season. Considerable feed savings may be possible without sacrificing reproductive performance. The pregnancy rate remains high under this management system.

Beef cattle producers may be able to predict the fertilizing capacity of bulls by measuring the circumference of the scrotum at weaning. Bulls that rank in the bottom quartile at weaning retain this ranking when yearling scrotal circumference is measured. Conversely, bulls in the top quartile at weaning have a larger scrotal circumference as a yearling. Bulls with small testicles at weaning have a lower fertility rate when used as yearling breeders.

**Diary Science**

A broad range of problems in both production and manufacturing is under research in dairy science.

Research into causes of embryonic mortality in cattle shows that cells from the lining of the uterus can be grown in the laboratory. Fluids from these cells increase growth and development of young embryos, which are also grown in the lab. This information will lead to a better understanding of the complex interaction that must occur between the mother's uterus and the young, growing embryo to sustain development.

Subiecting certain feeds to controlled high heat decreases protein solubility in the rumen, and increases the rumen bypass of these proteins. A study with young and old cows fed either extruded (controlled heat) soybeans or ground, raw soybeans has shown some stimulus to milk production when older cows were fed extruded soybeans, as compared to other cows of comparable age fed raw, ground soybeans. However, the milk fat test was significantly less for the group fed extruded beans. Young cows fed extruded soybeans showed no stimulus to milk production, but the depression in milk fat tests was again observed. If scientists can control the effect on fat test and maintain the stimulus to production, the process of extrusion may offer another market for soybeans.

Treatment of the aflatoxin B\textsubscript{1} with 9000 Xg post-mitochondrial supernatant preparations from the bovine liver and 5 x 10\textsuperscript{-6} lymphocytes from bovine peripheral blood produced a mutagenic (carcinogenic?) metabolite, as measured by the Ames mutagenesis test using *Salmonella typhimurium* TA98. Studies are continuing in an effort to determine the carcinogenic metabolites of aflatoxin B\textsubscript{1}.

**Entomology, Fisheries and Wildlife**

Insects that live in lakes and streams are of interest for several reasons. For example, the adults of some species cause annoyance or carry diseases to people and animals. Many kinds of fish, water fowl and other animals
depend on them for food. Since many aquatic insect species are sensitive to different types of water pollution, they are often studied to indicate the environmental quality of our surface waters. Upper Three Runs Creek, an unpolluted stream in the Savannah River National Environmental Research Park near Aiken, was found to provide habitats for over 600 insect species, more than has been reported for any other stream in North America. More than 60 of these species are new to science, never having been described or named before now. Many others have not been reported from South Carolina previously.

In recent years the corn earworm has become a major pest of soybeans in South Carolina. Damaging populations of this pest move from corn to soybeans during July, and insecticide treatments at that time of the season sometimes lead to more serious pest problems later. Clemson entomologists hope to be able to rely more heavily on natural factors, such as parasites and diseases, to reduce earworm populations. In 1982 two fungi saved the State’s growers millions of dollars in control costs by suppressing an expected outbreak of this key soybean pest.

Several research projects were concerned with aquaculture, defined as underwater agriculture. Two species which can be used for control of aquatic vegetation and algae were studied. *Tilapia*, which eats aquatic weeds, was investigated and found to be a suitable replacement for conventional sources of fish meal in diets for trout and catfish. Chinese silver carp, which filter algae, were cultured in effluent from a dairy farm. Presence of the fish lowered algal populations, reduced nutrients in the water and resulted in net production of 2237 lb/acre of silver carp. Natural resources, as they pertain to warmwater aquaculture (e.g. soils and water temperature), were surveyed. The coastal plains of South Carolina were rated generally average or above average in overall potential for freshwater fish culture.

**Food Science**

Food scientists investigate how food is processed and the influence of food on the nutritional well-being of people.

Research in meat products has been directed toward two areas: gelation of actomyosin, the major protein of muscle tissue; and texture profile analysis of shelf-stable and refrigerated frankfurters. During heating of raw frankfurters, actomyosin cross-links to form the gel network that determines texture. The rate of heating and moisture binding in the protein gel are critical to the formation of strong gel structures.

The effect on texture can be detected instrumentally and by consumer taste panels. Hardness, brittleness, cohesiveness, elasticity and frankfurter skin strength (for the “bite” or “snap”) become unacceptable if canning-type temperatures are used. However, laboratory results indicate that modifications of current frankfurter processing methods can yield a
product that requires no refrigeration and is of acceptable texture. This is significant since all frankfurters are currently refrigerated.

The manufacture of fermented sausage has changed dramatically with the use of frozen concentrated lactic starter cultures which permit the desired acidity to be achieved within 24 hours. Processes which use the natural flora of the meat as the source of lactic bacteria require extended incubation periods of three to five days. Since bacteria grow in meat at temperatures used to incubate fermented sausage, rapid growth of the starter culture becomes critical to avoid potential growth of foodborne pathogens.

Research was initiated to evaluate the critical factors influencing the growth of the starter culture and potential pathogens. Liquid smoke was selected as a possible factor because of its possible antimicrobial properties. Liquid smoke solutions are commonly used in meat products, but their use in fermented sausage is not consistent with traditional practices. Traditionally, fermented sausage is smoked during cooking after fermentation. Liquid smoke is added to the initial raw mix after the starter culture is added. Phenols in the liquid smoke appear to be mainly responsible for the smoky aroma and taste imparted to food products and are well known for their antimicrobial properties. Final pH values, titratable acidity and lactic bacteria counts were not affected when fermented sausage was manufactured, although exponential growth was delayed. Growth studies in a broth medium containing liquid smoke suggest that liquid smoke has the potential for inhibiting the lactic starter cultures. The use of liquid smoke in traditional manufacture of fermented sausage appears inappropriate.

Osteoporosis, a condition in which bond mass is decreased per unit volume, afflicts 25 to 30 percent of the postmenopausal women in the U. S. and manifests itself as an increased susceptibility to “minimal trauma” fractures, especially of the rib and vertabrae. Research on the cause of osteoporosis has centered on hormonal and/or dietary manipulations. Removal of the ovaries, and hence of the estrogen, has been linked to the development of osteoporosis and has increased consumption of compounds that form acids in the body. In young rats, removal of the ovaries resulted in less bond mineral per unit of body mass with no significant alterations in bone protein composition. Similar changes in the bone were noted when rats were fed diets containing higher than normal levels of inorganic sulfate or ammonium chloride, both of which form acids in the body. These changes were not observed with increased levels of inorganic phosphate, another physiological acid.

While these alterations had been linked previously to development of osteoporosis, the changes observed in bone composition are more suggestive of osteomalacia or rickets than of osteoporosis. Further work is planned to investigate the effects of organic forms of the physiological
acids and to further characterize the bone protein components and their relations to dietary modifications.

**Home Economics**

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

Winthrop faculty participated in a Southern regional research project on the nutritional status of adolescent girls, 12, 14 and 16 years old. Anthropometric, socioeconomic and dietary data were collected from 80 area females. Biochemical analyses were performed on fasting blood samples from the girls and determinations were made for triclyceride, cholesterol, iron and vitamin C. The data are being combined with those from eight other states.

The study of the relationship between nutrition education in elementary schools and school lunch plate waste was continued. Additional data were obtained on the calorie content of school lunches. Nutrition knowledge and attitude/practice tests were administered to fourth and fifth grade students and their teachers and foodservice managers in elementary schools. Calorie content of meals from the same specified menus varied considerably among the eight schools; a majority of the meals did not meet one third of the recommended dietary allowance for calories. No significant relationship was found between nutrition-knowledge scores of students, teachers or food service managers. Significant relationships, however, were observed between teachers’ and food service managers’ nutrition attitude/practice scores.

A project entitled, “Nutritional Status of Independent-Living Elderly from Three South Carolina Counties” was initiated. Questionnaires have been developed for collecting dietary, socioeconomic and health data. Data collection will be made at three congregate meal program sites for the elderly.

**Horticulture**

Branch Experiment Station faculty and their staffs perform one-third of the horticulture department’s work. The greatest potentials for horticultural crop expansion exist in the eastern half of South Carolina where Clemson’s three branch stations are located.

Cultivar tests, drip irrigation and plant nutritional studies with pecans has solidified into a sound program to complement peach and vegetable research at the Sandhill Experiment Station. A new laboratory and greenhouses at this same station support major irrigation field plot research with multiple cropping, irrigation and nutritional optimization for vegetable crops. Facilities and faculty staffing are now adequate to serve both the sandy Midlands and the Coastal Plains areas.
An All-American Selection okra variety, White Dwarf, and three more vegetable varieties (a pole bean, a cucumber and another okra) were released at the Coastal Research Station. The Edisto Station released “Resisto” sweet potato with multiple insect and wilt pest resistances (cooperatively with USDA-ARS Vegetable Breeding Laboratory). Edisto researchers also increased their pest resistance breeding and genetic studies with melons.

Vegetable researchers at Clemson, Edisto and Charleston studied sweet potatoes for alcohol production and proved that great potential exists for genetic advances in fermentable carbohydrates for alcohol. Colossus 80 southern pea was also released.

Plant growth and yield prediction modeling with several vegetable, fruit and agronomic crops produced a major publication in support of scheduling decisions for planting, protecting from pests, and marketing these crops.

Ornamentals research released holly cultivars, started regional adaptation trials with a new conifer and initiated research on microcomputer-assisted landscape design processes. Studies of mulches and soil amendments from natural products led to the publication of research results using seaweed, cinders and paper products. Regional release of a new Kentucky Bluegrass and nutritional and inter-species competition studies with turfgrass produced final published results.

**Plant Pathology and Physiology**

A reduced fungicide spray schedule for peaches was implemented in several commercial orchards. In all locations, control of brown rot and scab was equivalent to standard spray schedules.

Southern blight of tomato was successfully controlled in the stake-plastic mulch cultural system by applying 98 percent methyl bromide immediately before laying the plastic mulch. There is no other time slot in the stake-plastic mulch system that will permit treatment for control of the mycelium and sclerotia of the southern-blight organism. Without control of southern blight, the entire crop may be destroyed.

Biological suppression of plant pests is a promising alternative means of control. Results of data include a fungus found to be parasitic on living nematodes. By changing the environmental conditions in the greenhouse, almost 100 percent of a ring nematode population can be killed by the fungus.

Another approach to nematode control is to manipulate the ground cover. Native as well as crop plants are being evaluated as suitable hosts for ring nematodes. Results indicate that some of the common plants used for ground cover in orchards may be increasing nematode populations and adding to losses caused by peach tree short life. Other plants do not support ring nematodes and may be alternatives for ground cover that will reduce the nematodes and the disease.
In 1981, several pest weeds of South Carolina were found to be severely diseased. Of special interest were pigweed, sicklepod and spurred anoda. The disease-causing organisms were cultured and tested as controls. Some of the leaf spot diseases are being field tested against sicklepod for feasibility as a commercial control measure.

Poultry Science

A passive solar brooder house was studied during the winter. Thermal walls and clerestory windows gained enough heat to raise inside temperatures by about 30°F on a clear day. This type of house is more expensive to build than an ordinary brooder house, but when coupled with rotational rearing of broilers it could significantly reduce brooding costs for producers.

In attempts to produce a leaner chicken, researchers began studies to determine the mechanism of fat deposition in rapidly grown chickens. Fat tissue removed from young chickens did not regenerate as the bird grew. This demonstrated that the amount of inherited fatty tissue in a young chick determines, to a large degree, the amount present in the bird at slaughter. Another fat-deposition study found that a high level of salt in the diet reduces the amount of fat in the carcass without reducing growth rate.

Broilers have not been commercially grown in cages because of the development of weak wing bones, as compared to birds grown on floors. A study compared heights of cages to test the theory that taller cages provide more wing movement, which produces stronger wing bones. The theory proved correct when there was an increase in wing bone strength with each increase in cage height. Studies are under way to determine whether this wing bone weakness can be overcome by altered nutrition.

Branch Stations

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

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

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

The Coastal Station at Charleston furnished data to the Extension Service for work with vegetable growers in the Coastal Plains. Ornamental research is conducted at the facility, and 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 Station at Blackville designs its research for growers and cattle producers in the Upper Coastal Plains. Field crops like corn, soybeans, small grains, melons and sweet potatoes are studied, along with cattle.

**Active Research Projects, 1981-82**

**Agricultural Economics and Rural Sociology**


Organization and Efficiency of the Fruit and Vegetable Production Marketing Subsector in the South.


Impacts of Technical and Economic Changes on S. C. Farms.

Impact of Selected Institutional Factors on S. C. Agriculture.

Local Fiscal Impact of Economic-Demographic Change in S. C.

Price Discovery and Informational Flows for Major Agricultural Commodities in the Southern Region.

Social and Economic Impact of Adopting Mechanical Tobacco Harvester in S. C.

Structures and Adjustments of S. C. Agricultural Sector.

Local Factors Affecting Industrial Plant Locations in S. C. Communities.

Optimum Number, Size and Location of Commercial Grain Storage in S. C.

Economics of Row Crop Irrigation in S. C.

Changing Structure of Agriculture: Causes, Consequences and Policy Implications.

Market for Stillage, Wet Distillers Grains and Dried Distillers Grains in S. C.

Relative Regional Shifts in Labor Productivity in S. C.

Economic Analysis of Farm Land Market in S. C.

An Economic Analysis of Alternative Marketing Strategies for Cotton Producers.

Supply, Pricing and Marketing Alternatives for Cattle, Beef Systems in the South.

Acquisition and Analysis of Census and Other Demographic Data for S. C. and the U. S.

Economic Analysis of the Potential for Increased Swine Production in S. C.

Economic Analysis of the Use of Resources on Small Farms in S. C.

Market Information and the Nature of Price Dispersion in Retail Food Outlets.

Agricultural Regulation vs. Incentive Programs for Improving Water Quality.

Economies in Size in Hog Slaughtering Plants in S. C.
Economic Issues in the Conversion and Protection of Agricultural Land in S. C.
Economic Impact of Rising Prices on Land and Water Resource Use in S. C.
Economics of Horticultural Crop Production in S. C.
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.

Agricultural Engineering
Soybean Production and Management Simulation Models.
Automatic Controller to Improve Harvest Efficiency and Reduce Soybean Damage.
Non-Point Source Pollution from Grassed and Forested Land in the Piedmont of S. C.
Utilizing Anerobic Livestock and Poultry Lagoon Sludge.
Potential for Ambient Air Grain Drying in S. C.
Housing for Low and Moderate-income Families.
Utilizing Swine Lagoon Effluent on Forest Land.
Flue-cured Tobacco Bulk Curing Technology.
Trickle Irrigation in Humid Regions.
Animal Waste Utilization and Treatment Systems.
Viability of Soybeans in Storage.
Energy Reduction for On-Farm Processing of Agricultural Products.
Optimize Efficiency of Energy Utilization in Agricultural Housing Systems.
Ethanol Production and Energy Efficiencies for On-farm Fuel Production.
Equipment for Mechanization of Production of Oysters and Other Shellfish.
Water Table Management for Crop Production in the Coastal Plain of S. C.
Development of Vegetable Harvesting Systems.
Cultural Systems and Equipment for Mechanization of Peach Production.
Cord Wood Gasification/Combustion Demonstrations for Curing Flue-cured Tobacco.
Irrigation Scheduling Models for Efficient Use of Water and Energy.
Control Systems for Optimizing Tractor Energy and Fuel Consumption.

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Physical Properties and Mechanized Sorting of Peaches.
Energy Reduction for Crop Production Systems.

**Agronomy and Soils**
Adaption and Breeding of a Cool-Season Forage Grass Species.
Production Practices of Flue-cured Tobacco.
Breeding Disease Resistant Flue-cured Tobacco for Improved Yield, Quality and Harvesting Efficiency.
Development of Weed Control Practices in Corn, Cotton and Soybeans.
Enhancing Biological Dinitrogen Fixation in Soybeans and Other Legumes.
Cotton Breeding.
Selection of Tall Fescue and Hardinggrass for Persistence in Coastal Bermudagrass in the Piedmont.
Primary Root Development in Soybeans on Compacted Coastal Plains Soils.
Development of Soybean Varieties Adapted to S. C.
Movement and Retention of Water and Solutes in Selected Southern Regional Field Soils.
Corn Breeding.
Rhizosphere Ecology as Related to Plant Health and Vigor.
Rate of Soybean Root Growth and Nutrient Uptake as a Function of Varieties, Soil Properties and Additives.
Chemical Changes in Atmospheric Deposition and Effects on Land and Surface Waters.
Soil Properties and Nutrient Levels in Relation to Nutrient Uptake by Corn and Soybeans.
Sunflower Improvement.
Significance and Distribution of Mineral Components in Southern Soils.
Small Grain Breeding and Genetics.
Grain Yields and Field Performance of Barley, Oats, Rye and Wheat.
Cultivar Performance Evaluation of Cotton, Soybeans and Peanuts.
Cultivar Performance Evaluation of Corn and Grain Sorghum Hybrids.
Effect of Minimum Tillage and Rotation on Soybean Production in S. C.
Sulfur and Nitrogen Components of Precipitation and Effects on Soil Fertility and Plant Nutrition.
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 S. C.
Animal Science
Forage Systems for Beef Cattle in the Southern Region.
Marketability and Acceptability of Beef Produced Under Forage-grain Management Systems.
Forage Systems for Production of Beef from Conception to Slaughter.
Reproductive Physiology of Farm Animals.
Management Practices for the Early Weaned Pig.
Dietary Nitrogen Sources for the Young Equine.
Nutritional Systems for Swine to Increase Reproductive Efficiency.
Prevention of Blood Clotting and Measurement of Hormones in Ovarian Vein Plasma in the Cow.
Rectally Infused Magnesium Chloride for Prevention of Deaths in Cattle Affected with Hypomagnesemia.
Endocrine and Immunosuppressive Mechanisms and Maternal Recognition and Pregnancy in the Beef Cow.
Biochemical Characterizations of the Porcine Stress Syndrome.
Muscle Yield and Processing and Packaging Techniques for Pork.
Wintering Horses on Bermudagrass Pastures Overseeded with Oats, Rye, or Rye and Ryegrass.
Physiological Role of Relaxin During Reproductive States in the Gilt.
Factors Affecting the Immune Process in Cattle and Poultry.

Dairy Science
Factors Affecting Nitrogen Economy of the Bovine.
Optimizing Nutritional Management of Dairy Calves.
Influence of the Pituitary-gonadal Axis Reproductive Function in Cattle.
Forage Feeding Systems for Growing and/or Lactating Dairy Cattle.
Influence of Ration Composition on Plasma Hormones and Lipid Metabolism in Dairy Cows.
Effect of Chemical Change in Light-induced Off-flavored Milk on Its Consumer Acceptance.
Physio-chemical Properties and Usefulness of Hydrolyzed-lactose Dairy Products.
Effects of Environmental and Management Stressors on Production and Reproduction in Dairy Cattle.
Iodine Concentrations in Milk and Milk Products.
Metabolism, Toxicokinetics and Physiological Effects of Aflatoxin B1 in the Bovine.
Effect of Media, Culture and Storage on Survival of Cattle and Sheep Embryos.

Entomology, Fisheries and Wildlife
Bionomics and Control of Insects on Cotton.
Ectoparasites of Poultry and Synanthropic Flies Associated with Poultry and Livestock, Their Biology and Control.
Biology and Control of Arthropods Affecting Man and Animals. 
Epizootiology and Transmission of Leucocytozoonosis in Poultry. 
Bionomics and Control of Billbugs Injurious to Corn. 
Bionomics and Control of the Pecan Weevil. 
Biological Control of Insect Pests of Soybeans. 
Interaction of Lepidopterous Defoliation of Soybeans. 
Insecticide Resistance in Beneficial and Destructive Insects in Field Crops. 
Development of Microbial Agents for Use in Integrated Pest Management Systems. 
Physiopathological Relationships Between Insects and Pathogens. 
Habitat of Bobcats in S. C. 
Control of Tobacco Insects. 
Feral Swine Movement, Habitat Utilization and Pig Survival. 
Identification and Distribution of S. C. Insects of Economic Importance. 
Control of Vegetable Insects in the Piedmont Area of S. C. 
Biology and Control of Arthropods on Apples. 
Management of Culture of Molluscan Species. 
Behavior and Potential of Endemic and Imported Natural Enemies in Management of Soybean and Insect Pests. 
Insect Resistant Soybean Cultivars. 
Biology, Behavior, Population Dynamics and Management of Peach Insects and Mites. 
Integrated Management Strategies for Insect Pests of Forage Crops and Feed Grains. 
Bionomics and Control of Aphids and Scale Insects Attacking Ornamental and Greenhouse Plants. 
Tactics for Management of Soybean Pest Complexes. 
Warm Water Aquaculture. 

Food Science 
Function, Nutrient Composition, Quality, Stability and Efficient Production of Poultry Products. 
Factors Influencing Nutrient Absorption. 
Nutritional Effects of Jejunoileal By-pass Surgery. 
Quality Maintenance and Control in the Marketing and Storage of Vegetables. 
Fermented Peanut Foods. 
Development of Improved Soy and Peanut Protein Isolates. 
Prediction of Nutritional Quality of Foodstuffs. 
Surface Activity and Hydrolytic Enzyme Effects in Emulsion Stabilization.
Nutrient Status and Hypertension in S. C. Adolescents.
Thermal Processing of Foods Packaged in Retortable Pouches.
Functional Properties of Proteins.
Interrelationships of Dietary Carbohydrates and Lipid Metabolism in Rabbits.
Behavior and Lipases and Related Enzymes at Low Water Activities.
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.

Horticulture
Detection and Evaluation of Plant Growth-Environment Relationships.
Peach Breeding.
Evaluation of Strawberry Cultivars in S. C.
Nitrogen Requirements for Containerized Nursery Plants in Bark Growth Mixes.
Plant Germplasm — Its Introduction, Maintenance and Evaluation.
Improved Practices for Culture and Management of Peaches and Grapes.
Evaluating and Selecting Superior Fruit Cultivars.
Vegetable Variety Testing and Improvement.
Pre- and Post-Planting Bed Plant Experiments and Field Evaluations of Bedding Plants and Perennials.
Grape Germplasm Evaluation for Enological Utilization.
Breeding, Germplasm Improvement, Evaluation and Genetics of Small Fruit Crops (Blueberries and Brambles).
Vegetable Production Systems for the Midland Area of S. C.
Cultural and Management Practices for Pecans.
Quality Maintenance and Improvement of Fresh and Processed Horticultural Crops.
Alternative Full-bed Mulch Production Systems for Tomatoes.
Industrial By-products as Container Mix Components for Plant Growing Media.
Pollination, Rootstocks, Cultivars and Physiological Problems of Apples in S. C.
Breeding and Evaluation of Sweet Potatoes for Fresh Market and Industrial Uses.
Chemical Control of Soil Insect and Nematodes in Sweet Potatoes.
Cultural Management in Centipede Grass.
Characterizing and Delaying Ripening and Senescence in Peaches, Nectarines and Plums.
Use of Selected Marine Materials and By-products for Certain Horticultural Crops.
Evaluation, Propagation and Dissemination of Ornamental Plant Material.
Breeding Edible Southern Peas with Resistance to Insects and Disease.
Weed Control Practices for Vegetable Crops.
Urban Horticulture for Coastal S. C.
Breeding and Evaluation of Watermelon and Cantaloupe Varieties.
Breeding Disease Resistant Pumpkins for the Halloween Market in the Southeast.
Turfgrass Culture and Improvement.
Growth Regulators and Scion-rooted Trees for Peach Production.
Bedding Plant Fertilization and Field Evaluation of Bedding Plants and Perennials.
Determination of Cascading Chrysanthemum Response Groups and Cultural Program Development.
Breeding Potential of African Okra Germplasm, Abelmoschus.
Establishment of Landscape Plants with Low Resource Utilization.
Vegetable Breeding: Developing Improved Cultivars and Germplasm.

School of Consumer Science and Allied Professions, Winthrop College
Career Projections and Attainment of Low Income Youth: Changes Over Time.
Nutritional Education and School Lunch Plate Waste in Elementary Schools.
Nutritional Health of Adolescent Females.

Plant Pathology and Physiology
Peach Tree Short Life: A Physiological Approach.
Development and Evaluation of Rootstocks for Peaches.
Etiology and Control of Diseases of Shade and Ornamental Trees.
Epidemiology and Control of Fruit Diseases in S. C.
Hoplolaimus Columbus: Effect of Biophysical Factors on Distribution, Production and Pathogenicity.
Forage Legume Viruses.
Viruses and Mycoplasma-like Organisms Causing Diseases of Corn and Soybeans.
Mycotoxins of Corn and Other Feed Grains.
Physiological and Biochemical Mechanisms of Herbicide Action.
Tobacco Disease Control in S. C.
Cause and Control of Pod and Stem Rots of Peanuts.
Methodology, Dissipation and Fate of Pesticide Residue in Agricultural Ecosystems.
Disease Control on Vegetables.
Reduction of Aflatoxin Development in Corn by Cultural Practices and Breeding.

Biological Control of Weeds with Fungal Plant Pathogens.

Variability of Root-knot and Cyst Nematodes and Factors Influencing Their Population Dynamics.

Contributing Factors to and Control of Peach Tree Short Life in S. C.

Etiology, Epidemiology and Control of Pecan Diseases.

Causes and Control of Diseases of Cereal Grains in S. C.

Etiology and Control of Fungal and Viral Diseases of Vegetables.

Causes and Control of Diseases of Ornamental Plants.

Etiology and Control of Plant Diseases Associated with Commercial Production of Ornamental Plants.

Biology and Control 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.

Partial House Brooding and Rotational Rearing in Broilers.

Protection of Domestic Poultry Against Fowl Cholera Disease Using an Avirulent *Pasteurella multocida* live vaccine.

Nutritional Factors Affecting Metabolism of Skin and Adipose Tissue in Meat-type Birds.

Effects of Ingredients and Ingredient Processing on Production Efficiency of Meat-type Birds.

Nutritional and Non-nutritional Aspects of Leg Abnormalities in Turkeys and Broilers.

Endocrine and Physiological Effects of Heat Stress to 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 of Chicken Semen.
Experiment Station Publications, 1981-82

**Bulletins**

SB 596 — Inspection and Analysis of Commercial Fertilizer. Hilton Rogers.


SB 636 — South Carolina Agriculture. Larry Bauer and Thomas Burch.


SB 639 — Interregional Competition Analysis in Peaches. Larry Bauer, David Tholstrup and Gary Wells.


**Circulars**


SC 187 — Imported Clones of Ilex Crenata *Radicans*. David Bradshaw and Lonny Schmid.


**Technical Bulletins**


**Technical Contributions**


1949 - Parasitism of the Tobacco Budworm on Tobacco in South Carolina. Albert W. Johnson and Donald G. Manley.


1963 - Peach Tree Short Life: Putting the Puzzle Together. George E. Carter, Jr.

1964 - The Effects of Red and White Light During the Prebreeder and Breeder Periods on Egg Production and Feed Consumption in Large White Turkeys. J. E. Jones, B. L. Hughes, R. J. Thurston, R. A. Hess and D. P. Froman.


1997 — An Annotated Checklist of the Caddisflies (Trichoptera) of Mississippi and Southeastern Louisiana. Ralph W. Holzenthal, Steven C. Harris and Paul K. Lago.


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2006 — The Effect of Particle Size on the Conversion of Corn to Alcohol. R. E. Gantt and R. O. Hegg.


2027 — A New Species of Micrasema (Trichoptera: Brachycentridae) from the Gulf Coastal Plain. Jay W. Chapin and John C. Morse.

2028 — Parasitism of the Nematode Criconemella Xenoplax by the Fungus Hirsutella Heteroderiae. B. A. Jaffee and E. I. Zehr.

2029 — Factors Affecting the Heat-Induced Polymerization of Beef Actomyosin. Gregory R. Ziegler and James C. Acton.


2031 — Resistance in Tobacco to the Tobacco Budworm. Albert W. Johnson and James F. Chaplin.

2032 — Effects of Growth Regulators and Nematodes on Cylindrocladium Black Root Rot of Soybean. B. A. Fortnum and S. A. Lewis.

2033 — Growth Regulator Inhibition of Tobacco Callus Growth. N. D. Camper, Merrill Wilcox, K. L. Ellers and J. E. Doeller.


2037 — Effect of Dietary Calcium and Phosphorus on Bone Strength and Growth of Guineas. B. L. Hughes, D. R. Sloan and J. E. Jones.
2038 — Bacterial Quality of Recycled Wastewater Used for Flushing Holding Pens. J. J. Janzen and J. R. Bishop.

2039 — The Effect of Reverse-Protein and Low Protein Feeding Regimes in the Rearing Period on Pullet Growth, Subsequent Performance and Liver and Abdominal Fat at End of Lay. D. V. Maurice, B. L. Hughes, J. E. Jones and J. M. Weber.


2042 — Preliminary Information on Grafting Scions from Plants Treated with Cygon onto Camellia Oleifera Rootstock. Luther W. Baxter, Jr., Susan G. Fagan and Peggy A. Mitchell.


2054 — Short Life of Peach Trees Induced by *Criconemella xenoplax* and *Tylenchorhynchus claytoni*. A. P. Nyczepir, E. I. Zehr, S. A. Lewis and D. C. Harshman.


2057 — Compositional Changes in Relation to Vigor in Germinating Cabbage Seed. Edward G. Loomas and Orrin E. Smith.


2060 — Effects of Interspecific Competition and Dietary Stress on the Velvetbean Caterpillar and the Soybean Looper. Edwin M. King.


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

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

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

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

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

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

**Agriculture and Natural Resources**

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

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

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

**Agricultural Engineering**

A major effort in Extension agricultural engineering was made in the area of herbicide incorporation. Ten area meetings were held to teach growers and county Extension agents proper methods and procedures for incorporating herbicides. These attracted about 500 persons. In addition, field plots were put in to show actual effect of incorporating techniques as well as the on-going tillage and irrigation scheduling demonstrations. Five field tours and two television programs were organized to show results from the field plots. Information gained from the plots is published in the Corn Production Guide for South Carolina.

Continued emphasis was given to improved energy management in production agriculture. On-farm production of fuel ethanol was demonstrated at three regional meetings, and the demonstration plant has been used to generate additional feedstock-to-ethanol conversion information for South Carolina crops. Extension circular 584 was revised to complement educational programs on use of wood for home heating and process heat in agriculture.

There is much interest in bio-mass utilization for process heat for tobacco curing. Field demonstrations as well as television, radio programs and the State Tobacco Tour kept growers abreast of current technology. Energy management in bulk tobacco curing has become very important. Training of both county Extension agents and growers was carried out at grower meetings, training sessions for agents and a special bulk barn program offered through Florence-Darlington Technical College. Additional energy information was included in the Tobacco Growers Guide.

With more than 120,000 acres under irrigation, some parts of the state ran short of water in 1981, highlighting the need for more information on water availability. Increased educational attention is being turned to this. Efficiency tests have been initiated to check performance of irrigation systems, especially center pivot systems. Scheduling of water applications with water moisture monitoring devices has been stressed.

More educational programs are being directed toward use of microcomputers. Software is being produced for use by county agents and farmers. Computer applications which stress the efficiency of the farming
operation were addressed during the series of meetings on herbicide incorporation.

South Carolina has many new, modern livestock and poultry housing systems. The operators of these facilities are concerned about accurate environmental control, effective natural and mechanical ventilation during hot weather, and how to handle the large quantities of manure generated. The farm building plan service provided by the department maintains a wide range of modern up-to-date plans for new facilities and information on remodeling older housing.

Current economic problems have virtually halted family residential housing starts of the state. Extension agricultural engineering housing programs have centered around alternatives to single family residences, rental practices, financial changes, supplemental or alternative heating methods, and repair and remodeling possibilities. Maintenance problems of existing units have brought further requests for information on roofing, painting and moisture control.

The safety program has completed a one-year farm accident survey and data analysis for incorporation into education programs. Fire safety programs, particularly those related to home heating with wood and training emergency medical service personnel in farm safety, have received special emphasis.

Agronomy

Rising production costs and low commodity prices have forced South Carolina farmers into a severe cost-price squeeze. All crop production practices have come under close scrutiny as farmers seek to reduce costs while maintaining high yield levels. Extension agronomy, through close cooperation with agri-business personnel, county Extension offices and other government agencies, continues to provide the latest information on achieving high yields of field and forage crops.

Following are examples of educational activities conducted by Extension agronomists during the year:

1. Thirteen regional soybean production meetings drew 500 farmers.
2. State corn, soybean, cotton, tobacco and small grain field days, attended by more than 1,000 farmers.
3. Assisted with 75 county crop production meetings.
4. Carried out a soybean field survey which discovered new pests which need future research emphasis.
5. Conducted 100 on-farm test demonstrations on practices such as weed control, variety selection, no-tillage.
6. Used television, radio, farm newspapers and other mass media to provide timely information.
Animal Science

With favorable weather and terrain and abundant forages, livestock opportunities abound in South Carolina. Extension animal science is challenged to develop aggressive educational programs to meet these opportunities.

Horse enterprises are mostly for pleasure riding among the youth. However, winter training grounds exist here, and a growing number of horses is housed in South Carolina during the winter months. It is estimated that more than $150 million is invested in horses, land, equipment and facilities.

Improved management and marketing skills are keys to realizing true growth potential in beef and swine income. The swine industry has gone indoors, thus increasing total investment in buildings. Today, management skills do not allow enough pigs per litter to be weaned. In the marketplace we must organize to increase competition in bidding for swine. Also, we must convince producers that having genetically superior boars is important. We test some 80-100 boars each year, but this must expand to on-farm testing.

Central test stations can only confirm the importance of testing, they cannot test all boars needed. So increasing litter size, improving marketing means and expanding use of genetically superior boars are major areas of emphasis in swine programs.

In the beef area, management skills must be sharpened. Like swine, genetically superior males must be used more widely. The on-farm testing of bulls is stressed. A second bull station was to open in the fall of 1982. The South Carolina Cattlemen's Association is promoting this project with Extension providing leadership and supervision. The first annual Purebred Breeders Symposium was held and attendance was excellent. Cattlemen have approved an assessment program on tested bulls to support general maintenance and promotion of bulls in test stations.

South Carolina continues the struggle to establish feeder calf sales. Bright spots exist as do disappointing moments. Major successes have been on-farm direct calf sales through tel-o-auction and video. This past year one farm sold 1,200 stocker calves. So, progress has been made in the past three years. South Carolina livestock producers have all the natural resources and education to increase the quantity and improve the quality of their product.

Dairy Science

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

A seminar entitled "Milking in the '80s" was presented at seven locations in South Carolina. The seminar provided information on several
aspects of dairying for about 150 dairy producers and workers. Two field studies in reproduction management were conducted. Extension specialists worked with several producers to increase reproductive efficiency.

A field project on livestock safety index values and their relationship to milk production was conducted in conjunction with the Extension agricultural meteorologist. The results indicate how various heat stress factors occur in South Carolina during the summer. This data is being presented to producers by a variety of Extension methods. This could result in tremendous savings to dairy producers.

The Dairy Record Processing Center at Raleigh, which processes all dairy records for South Carolina dairy herds, implemented the DART (Direct Access to Records by Telephone) feeding program. Extension dairy specialists began using this computerized dairy herd feed program during the past year. This program has been well received by Dairy Extension Specialists as well as by the producers.

Approximately 30,000 cows in South Carolina are on the official Dairy Herd Testing Improvement (DHI) Program which offers dairy products the latest management information on milk production, milk fat, somatic cell count, protein and breeding information on each cow in their herds. In South Carolina the dairy operations of the DHI Association are handled jointly by the S. C. DHIA, Inc. and Extension.

Through the DHIA program the latest computer use was initiated. Through DART, cooperating producers have at their fingertips access to all the management information stored in the main computer in Raleigh. Seven South Carolina herds are participating, and producers are pleased with this addition to the DHIA program.

Surplus milk has been a national problem within the dairy industry. As a result, considerable unrest exists. Extension dairy personnel, working in conjunction with various dairy associations, have assisted producers as well as processors in an increased marketing, educational and merchandising program.

Publications were highlighted during 1982 with the completion and distribution of the South Carolina Dairy Guidelines notebooks.

Entomology, Fisheries and Wildlife

A highlight of a busy year for Extension entomology was the involvement of the staff in the proposed boll weevil eradication program. Educational forums presenting the advantages and disadvantages of the program were conducted for cotton farmers. This was a cooperative effort with the USDA and the South Carolina Farm Bureau. Due to economic factors, the proposal failed, but the issue likely will surface again in 1982-83. During the current year, outstanding success with boll weevil and bollworm control has been obtained using pinhead square treatment and moth flight prediction respectively.
In cooperation with other Extension specialists and county agents, a pilot IPM (Integrated Pest Management) project was initiated for sorghum. Sorghum is more drought tolerant than corn, and many growers are interested in planting this alternative crop. Unfortunately, sorghum attracts many pests. Extension entomologists are seeking to determine control strategies for these pests. The current program involves surveying 400-500 acres in Newberry and Saluda counties to monitor pests and develop treatment thresholds. This will help determine if sorghum is a practical alternative crop to corn in South Carolina.

Pesticide applicator training has been and still is a high priority departmental item. A good example was the 1982 Spring Fly-In for aerial applicators. This event, held in cooperation with the S. C. Aerial Application Association, used high technology automatic data processing equipment to monitor aircraft spray performance. This enabled applicators to calibrate equipment accurately thus improving pesticide performance and reducing drift hazards.

The Fisheries and Wildlife Extension programs continue to be in great demand. The wildlife specialist was involved in seminars and marketing surveys looking at the potential for producing channel catfish and other aquaculture crops.

A proposal to develop a memorandum of understanding with the South Carolina Wildlife and Marine Resources Department to cooperate on teaching, research and Extension programs was a major step which should result in a more efficient and effective means to provide information to the public for both agencies.

Food Science

Increased irrigation acreage is expected to expand vegetable production in South Carolina. Extension food science has examined the possibility of establishing a vegetable processing facility to handle increased production. Preliminary results were very favorable for establishing a 40 ton per day individual quick frozen vegetable processing plant. Details have been published along with projected market volume and suggested commodity pack window schedules developed by Extension agricultural economics and horticultural specialists.

Extension food science developed schedules for processing beans in tomato sauce and applesauce for military field ration retortable pouches and for steam cooking and pasteurizing crab meat in metal containers. In both instances the schedules were implemented by South Carolina processors resulting in thermoprocessing energy savings plus improved product quality.

In other technology transfer activities, commercial facilities were provided with advisories on sulfiting diced peaches before freezing, principles and procedures of raw commodity precooking, design modifi-
cation of a nuclear waste ultrafiltration recovery system for adoption to food processing systems, startup of a new grape juice pressing line layout and evaluation of alfalfa sprout packaging systems. Numerous on-site goods manufacturing and sanitation advisories assisted processors of apple cider, soft drinks, seafoods, vegetables, shelled hardboiled eggs and 13 community canneries.

In other projects, food scientists developed radio, television and news releases on food safety, food additives and food labeling; organized a statewide food industry association conference; provided leadership in several food processing trade and professional associations; participated in three one-day alcohol fuels demonstrations; and served as the Institute of Food Technologists regional communicator to South Carolina.

Extension food science continued to maintain a Food Regulation Information Filter Center which disseminated more than 3,875 notices of proposals, changes and new federal and state regulations to more than 1,050 South Carolina food industry companies. This enabled processors to participate in the promulgation of responsible regulations and avoid possible citations, fines or adverse publicity by having lead time to implement necessary regulatory compliance changes.

(Note: Fiscal year '81-82 budget reductions have resulted in a 50 percent manpower cut, to one specialist, in the Extension food science project area.)

**Forestry**

Two years ago Extension forestry initiated a competitive and fun event for young people in South Carolina. This year we added a state level competition to the county and district competitions. We plan to continue to expand the program and hope to field a team for the National 4-H Forestry Invitational in the fall of 1982.

The second Clemson Forestry Forum, held in March 1982, was attended by 162 professional foresters. We feel we have initiated a program of real interest to the professional forestry community of our State. The third forum is now being planned.

In cooperation with the South Carolina Forestry Commission, materials were developed for celebrating Arbor Day in South Carolina. Arbor Day is the first Friday in December of each year. For several years this day has not been observed. Last year the materials were used to conduct 41 Arbor Day programs. These enable people to be more aware of our natural resources, their management and their use.

During this past year we participated in the development of a series of six slide-tape programs on reforestation.

In 1980 the Foresters Council of South Carolina asked Clemson University to prepare publications for timber buyers to give to landowners. Two publications were developed and are now being distributed to timber
buyers. We feel a greater amount of reforestation will occur if the landowner can be reached before making a timber sale.

A forest and shade tree report notebook has been released to the county Extension offices and to other resource agencies. The notebook is a series of two-page notes on various insect and disease problems which influence forest and shade trees.

**Horticulture**

As the economy turns down, the number of home food gardens goes up. So does interest in small acreage fruit and vegetable patches to supplement cash income. Large scale cash crop farming felt a financial pinch in 1981 from poor grain prices and high interest costs. These economic factors caused a strong demand for horticultural training programs for county Extension agents, farm managers and other specialized sources of horticultural information.

Classroom and field short courses have been used to train county agents. Master gardener volunteer helpers were trained by urban and suburban agents in the three major metropolitan areas of the state. This created a volunteer force of more than 70 whose help has been invaluable. For example, in Greenville County, 14,679 gardening calls or drop-in clients were assisted in the five key gardening months of March through July. Serving the city is a strong Extension objective.

The Peach Orchard Management System (POMS) is Clemson's nationally recognized Extension innovation in cutting costs for peach growers. This year POMS started two even more effective segments. One dealt with reduced pesticide use and the other with food ripeness testing. POMS also developed a peach production handbook as a text for its short course.

Contact with clientele through radio, television and volunteers helps get information to people interested in home and city beautification. Food and nut crops, vegetable farmers, and commercial nurserymen are still being served primarily through demonstration trials, newsletters and published bulletins. Personnel vacancies throughout our program present a constant challenge. However, microcomputers, slide tapes and word processors are new ways we are trying to be more efficient.

**Marine Advisory Services**

**Commercial Fisheries**

A trawl designed from an Alaska Sea Grant publication was built in 1981 to be used with the commercial outboard shrimp fishery. We will continue with this demonstration during the 1982-83 shrimping season.

The staff talked with local researchers who presently use underwater video systems in their research and have decided that the equipment in use locally is not applicable to commercial equipment. Preliminary
arrangements have been made with the University of Georgia and a laboratory in Mississippi to look at equipment in use at this time.

Five editions of Marine Briefs were mailed to more than 1,000 commercial fishermen per edition. A special edition contained record keeping and tax management information.

Aquaculture

A hydraulics workshop was held in McClellanville, South Carolina to better inform local dredge operators of the theoretical aspects of hydraulics, maintenance and materials savings.

A publication entitled Intensive Hard Clam Mariculture was completed in 1981. Four individuals were assisted in on-site analysis of whether clam gardening would be feasible on their property.

We assisted the Consortium in coordinating workshops on hard clam culture and aquaculture legislation, and served as guides to various Sea Grant Research and Extension projects during the World Mariculture Society meeting in March 1982.

Technical assistance was provided to at least 40 area landowners interested in hard clam, prawn, shrimp and crawfish culture. We also worked with the South Carolina House Agriculture and Natural Resources Committee and Senate Fish, Game and Forestry Committee on the development of comprehensive aquaculture legislation and identification of issues.

Recreation/Coastal Management

A Coastal Cruising Guide to South Carolina has been completed which will provide boat tourists traveling in the Intercoastal Waterway with information about historic, scenic and natural features of the Carolina lowcountry.

The Coastal State Park Fishing Guide was completed and went on sale this summer.

Gulf Stream telemetry charts are mailed three times each week to marine users including commercial and sport fishers.

A series of programs on seafood storage and preparation was presented on the Beaufort ETV station by the Beaufort agent. Underutilized fish species were introduced to the general public by our home economist.

A three-day workshop on finfish use was developed for high school home economics teachers and Extension home economists.

Due to poor shrimp harvests in past years we have been active in developing a conch fishery for shrimp trawlers. One dock owner was assisted in setting up commercial retorts to cook conch so they could be shipped in a shell-less form. A commercial cannery was located and a contract was made to accept locally produced and cooked conch for this cannery.
Through sponsorship of a crawfish culture workshop and the South Carolina Crawfish Festival, interest in crawfish culture has greatly increased, and the aquaculture specialist assisted landowners in doubling the acres of crawfish culture in South Carolina in 1981-82.

Plant Pathology

The theme during 1981-82 has been to reduce grower operating costs by better recognition of harmful crop diseases and their causes. We have also stressed that proper and timely management of cropping systems and pest control procedures can result in reduced pesticide costs and stimulate more productive use of nonchemical controls. We have approached grower groups at meetings through publications, by direct contact demonstrations and through various news media.

The Plant Problem Clinic has been better equipped and staffed and is aiding the identification process greatly. Total specimens received numbered 5,600, and at least three new unrecorded diseases were identified. The Agricultural Services Laboratory is providing vital programs in detection of crop problems.

Work on black shank diseases of tobacco has resulted in reduced use of the fungicide Ridomil resulting in savings of $50-$60 per acre. Further achievements with tobacco involved more specific nonchemical controls of tobacco mosaic virus disease.

Teamwork with agronomists, entomologists and others has led to greater corn production and a reduction of aflatoxin hazards. With peanuts, field monitoring equipment placed with selected growers has been used as a weather monitoring system, coupled with a computer model for control of peanut leaf spot disease. The system has resulted in many growers reducing the number of leaf spot fungicide sprays by at least 50 percent.

Tomato growers following the IPM program in coastal counties have reduced fungicide sprays 40-60 percent, resulting in increased profits to growers. Peach IPM acreage continued to expand, and new diseases and peach short life problems were closely monitored. The need for a postplant nematicide for peaches stimulated field demonstrations in an effort to obtain use on DBCP for a proposed Section 18(c) emergency label. This was granted.

Soybean diseases are causing economic losses in most areas of the State. A concentrated effort to identify nematode problem fields and to stop the use of nematicides in fields with no nematode problems has resulted in greater awareness and use of profit-making control technique.

Poultry Science

Contract producers of poultry requested and received computer economic analyses of their production costs. Also, new and prospective
producers were provided assistance in this area. There has been a signifi­
cant increase in requests of this nature.

Under the National Poultry Improvement Plan, South Carolina is
certified as a pullorum-typhoid clean state. To provide continued sur­
veillance and assure this status was maintained, 32 new bloodtesters were
trained and certified, and 69 bloodtesters were recertified.

The department participated in programs for members of the South
Carolina Poultry Health Association. County Extension personnel re­
quested more assistance than usual with small flocks, hobbists, rabbits and
game birds. This resulted in the development of more information for
county personnel use.

South Carolina now has the distinction of having the nation’s largest
producer of coturnix quail for processing, and the Palmetto Pigeon
Processing Plant maintains its status as the world’s largest producer of
pigeons. Department personnel provided information and assistance to
these interests.

The poultry industry received special attention from department per­
sonnel on disease and management problems occuring throughout the
year. Respiratory diseases like fowl pox, gumboro, cholera and coccidiosis
are some of the more significant problems, and mismanagement or the
failure to pay attention to management details paralleled the importance
of the diseases.

Production-Marketing Economics

The basic function of the Extension production-marketing economics
group is to provide educational programs and training to farmers, agri­
businesses, Extension agents and the public about agricultural marketing,
farm management, agribusiness management, estate planning, income
tax management, agriculture policy and trade, computer applications, 4-
H and consumer economics.

The major thrust in 1981-82 was to provide farmers and other manag­
ers with the economic training and tools of analysis to do a more effective
job of management and marketing.

The following programs were conducted to help managers improve
their information base and their ability to make decisions and manage
risks:

Seventeen marketing workshops and seminars;
Fifteen farm management workshops and seminars;
Twenty-five outlook presentations including a statewide outlook
conference;
Twenty-five county meetings on agricultural policy, income taxes,
estate planning, farm management and marketing;
Several management sessions for low-income and commercial
cooperatives;
Five schools for tax practitioners (650 participants).
Literature development was a major educational emphasis. Economic issues influencing agriculture were discussed in “Outlook Updates” and “Management Marketing Memos.” Publications included “Extension Economics Reports,” leaflets and circulars. These materials covered a broad range of information on outlook, financing, planting decision, crop and livestock marketing, costs of production, agricultural policy, tobacco, irrigation, leasing, income and estate taxes.

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

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

More than 50 programs have been developed for microcomputers. A farm records program and an accounting program for tomato packing sheds have been completed. Extension’s work with microcomputers is increasing and has gained national recognition. Through a Kellogg grant of $360,000, a three-year program was begun to place microcomputers in county Extension offices. The computers will be used to deliver Extension education programs.

Due to increased demand for assistance, special emphasis was given to marketing and farm management programs in grain marketing, dairying and farm credit. A grant from SEA/Extension was obtained to study the alternative sources of farm credit. A publication of sources of farm credit has been prepared.

Community Development

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

CD emphasis is placed on helping community leaders, local governments, organizations and professionals in other agencies understand and solve community problems and obtain maximum benefits from community resources through wise use.

In 1981-82 surveys were conducted in five communities. Meetings to present survey results drew excellent participation from local community leaders, elected representatives and resource agency representatives. Identifiable results include the establishment of several community projects, increased interaction between elected officials and community
leaders, greater use of Extension’s services, and an enhanced image of county and state Extension offices as a resource for community development efforts.

Extension continues to assist the governor’s office in conducting a cooperative annual program, Emphasis/South Carolina, at which outstanding community efforts in beautification and community improvement are recognized through award presentations at an annual luncheon. This year’s program attracted 250 people from 35 counties. Extension provides organizational support for local and county beautification and community improvement committees which participate.

Extension and Soil Conservation Service continued to conduct educational programs in Resource and Conservation Development. Two television shows were presented and 15 county meetings were conducted with local government and community leaders on the impact of economic development and planning on land use in urban and rural areas. Specialists assisted the Governor’s Council on Rural Development in identifying the needs of the rural areas. Two meetings on public policies affecting land use were held with farmers.

A fiscal impact model and users manual have been developed to help communities analyze the financial impact of providing necessary community services for proposed industrial development. Personnel classification and compensation studies were prepared for seven rural communities. Several computer programs have been developed for use by local government, one of which has been used by three towns in evaluating the cost effectiveness of emergency medical service.

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

Circulation of the Extension CD Newsletter has increased to 1,500. Video tapes were produced on leadership surveys, community industrial development and land use planning.

**Extension Home Economics**

**Scope of Activity**

Home Economics deals with people’s physical environment and their nature as social beings. The interrelations of these components and the significance of their relationships require an interdisciplinary approach to solving problems.

Extension home economics through the land grant university is organized around six subject matter areas: child development and family relations, clothing and textiles, family resource management, food and nutrition, interior design, and housing. Extension home economists aim to help individuals and families in South Carolina develop the knowledge
and skills essential to a satisfying life in an increasingly complex world. Information is delivered through county agents in each of the 46 counties. Their primary responsibility is Home Economics education for youth and adult audiences.

Extension Home Economics is proactive as well as reactive, since prevention is more desirable and less costly than correction. Research, new knowledge, national and state trends all serve as indicators for proactive educational efforts.

During the next five years Extension home economics programs will center on four major identified programs: family economic stability and security; energy and environment; food nutrition and health; and family strengths and social environment. The six major subject matter departments will work in an interdisciplinary manner to find solutions to the many problems within those areas.

Following is a brief overview of each subject matter area for 1981-82.

**Child Development and Family Relations**

Special interest groups, Extension homemaker clubs, and 4-H programs were conducted in areas of child development and family relations. Also, articles for daily newspapers and Extension newsletters reached thousands of families. Radio programs of varying lengths were presented throughout the State. The home study courses, “Baby Talk,” “Pointers for Parents of Preschool Children,” and “I Am A Person” were sent to approximately 1,000 South Carolina families.

The Parent/Child Interaction program has provided in-depth study of parenting skills to approximately 345 parents. It continues to be one of our strongest long-term programs, giving us lasting new clientele. The major concept is to teach parents that they are their children’s first and most important teachers.

The child development and family life specialist conducted in-service training to agents in 36 counties via self-study on the topic “Aging Positively.” The counties are planning programs on aging for 1982-83. Programs on strengthening families were held in several counties.

**Clothing and Textiles.**

Weight loss is a natural and desired outcome of the current emphasis on good health and physical fitness. This year a Dressing Slim series has been developed to accompany the Eating Slim weight loss program that has been in effect for several years. Agents from 40 counties have been trained to present this program which includes four videotapes, two instructional kits, four leaflets and a teaching manual. At present, four other states have asked to preview the series.

The speed tailoring program, initiated this past year, continues to be a very popular program. In 1981 311 people were taught speed tailoring. If
a value of $25 were assigned for the workshop, a total of $7,775 was saved. If each person made just one jacket at a savings of $80, the total would be $32,655. One individual has already constructed eight blazers.

A quarterly home sewing retailer newsletter was begun this year for retailers and home sewing professionals. Three editions totalling 3,300 copies have been distributed.

One goodwill project initiated by the clothing specialist and carried out by the Extension Homemakers Council collected more than 3,200 pounds of fabrics, sewing notions, and other needed supplies to assist a home economist in Antigua in her Peace Corps assignments. The homemakers also collected $2,200 to ship the supplies to Antigua and purchase other items. This project has received publicity throughout the State.

Family Resource Management

The economic situation has reached crisis proportions for South Carolina families who have experienced unemployment or other financial distress. During 1981, county Extension agents in 30 counties conducted a total of 262 personal financial counseling sessions. If this service had been purchased from private vendors at $50 per hour, the total saved by these clients would have been $37,650.

Another example of financial assistance provided to South Carolina citizens in the personalized budget analysis program using computers. In one lowcountry county 104 people received this service during a three-day period. Thirty-four other counties also conducted this sort of program.

Home care programs with emphasis on making home care products were offered in 21 counties with 30,000 copies of a leaflet, “Recipes for Home Care Products,” distributed throughout the State.

Foods and Nutrition

The Extension home economics foods and nutrition program has concentrated educational programs in two areas: nutritional status as it relates to good health, and wise use of food resources. Special efforts have been made to deliver educational messages to large audiences.

More than 500 people participating in “Eating Slim,” a behavior modification based weight control program, lost more than 10 pounds each; 100 young families participated in “Fun Food Facts,” a nutrition education program that stresses interaction between parents and children; 5,000 individuals participated in a variety of programs that stressed food budgeting, meal planning, and food safety; 25,000 people participated in food preservation programs.

The program also extended its outreach by training volunteers to deliver programs to 4-H and extension homemaker audiences. Cooperation between Extension and other state agencies has also enhanced food
and nutrition programs throughout the state. For example, interagency efforts between the Department of Health and Environmental Control and the Clemson Extension Service have helped to elucidate the problems of lead consumption in South Carolina children.

Expanded Food and Nutrition Education Program

In 1969 the Expanded Food and Nutrition Education Program (EFNEP) was launched to attack the particularly widespread problem of poor diets in America. EFNEP focuses on families with young children and helps them acquire the knowledge, skills, attitudes and behavior necessary to improve their diets. Since its inception, EFNEP has emerged as a highly successful program in changing dietary patterns and behaviors, and in effecting better management of total resources.

4-H EFNEP concentrates on youth from families with limited resources. Since 1969, EFNEP has reached 34 South Carolina counties. For the first six months of the current fiscal year, 4,016 different families were involved in the adult phase, and 2,775 youths were reached through 4-H EFNEP. Volunteer leaders continue to be recruited and trained to provide outreach efforts.

Interior Design

Emphasis in interior design has been on space planning this year. The current housing situation is characterized by smaller houses and increases in single person and single parent households, as well as increases in multi-family and extended family compositions. A learning packet entitled “Space Planning for Residential Interiors — Creative Furnishings and Interior Design Techniques” was prepared and made available to at least one agent in each of the 46 counties.

Six counties around Columbia worked jointly in developing and displaying educational exhibits supported by demonstrations at the Dutch Square mall to provide information on space planning. There were 2,835 contacts during the program.

Fifteen counties offered a new interior design correspondence course on design principles and selection and purchasing of furniture. Programs were also given on constructing home furnishing items and refurbishing used items.

Through a variety of teaching methods and teaching one message many ways, county Extension agents are reaching more and more people with interior design information.

Residential Housing

County Extension agents with responsibility for residential housing education reached a reported 19,333 South Carolinians with housing information last year, an increase of 114 percent over the previous year.
Agents concentrated their efforts in the following areas: energy conservation, home heating and heating safety, home repairs, home storage, moisture control and remodeling of kitchens and homes.

Other work areas in housing included home security and safety, solar housing, housing needs of the elderly and handicapped, painting, outdoor areas, home lighting, walls, and inflation as related to housing.

The most notable housing improvements made were in remodeling, conservation and home repair. The estimated economic value of Extension's assistance in these improvements is $80,280. In addition, one state agency used an Extension-researched and developed plan to remodel a kitchen for training handicapped clients to maintain independent living.

4-H and Youth Development

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

Participation

Since 1972 Extension has been concentrating 4-H efforts on identifying and training a corps of adult 4-H leaders in each county. The 1981 total of 2,515 adult and teen 4-H leaders was the largest number recorded in recent times. An Extension 4-H goal is to reach one-half of all 4-H enrollees through volunteer-led clubs.

In addition to the 45,130 enrolled in organized 4-H clubs, 20,350 are enrolled in short-term special interest projects (generally two-12 weeks). Among the most popular were embryology, bicycle care and safety, energy and environmental conservation, electricity and plant and animal science.

Additional contacts numbering approximately 7,500 were made through the 4-H camping program. The Expanded Food and Nutrition Education Program component of 4-H attracted another 4,000.

Program Emphasis

The primary emphasis of the South Carolina 4-H youth program concerns the recruitment, training and support of adult and teen volunteer leaders. The volunteering leader concept is essential if 4-H is to expand and enhance programming. This emphasis on volunteer leader development is bringing about a significant change in the roles and responsibilities of Extension professionals assigned to work with 4-H in the counties. Such changes are necessary to assure tax dollars are used most judiciously.

The 4-H program has long been instrumental in teaching the food production, processing, distribution chain to youth across the State. Renewed emphasis has resulted in a new curriculum about human foods and
nutrition and animal agriculture. Other curriculum areas under development or revision include forestry and swine.

At the national level it has been estimated that for every public dollar expended on 4-H, the equivalent of $10 has been provided by individuals and organizations from the private sector. Last year a South Carolina 4-H Foundation was formed as a component of the Clemson University Foundation system. The Foundation's goal is to increase private support to 4-H. Plans have also been completed to identify 4-H alumni throughout the state. A by-product of this effort will be a cadre of adults for leadership positions throughout the county and state 4-H systems.

Thus the emerging role of county professionals is that of managers of resources working with and through local volunteer leadership to serve the needs of youth. One result of this new role has been increased cooperation between 4-H and other youth-serving agencies and organizations.

**Special Programs**

Extension's special programs area extends efforts to reach those with low income and limited resources with educational information designed to improve their living standards. Extension is devoting more time to programs and projects to assist families who may be termed "less fortunate." Under the heading of farm-oriented and non-farm-oriented areas, problems are identified and objectives established in crop and livestock production, marketing, food production, nutrition, consumer education, youth development, housing and family life.

**Small Farms Program**

In the farm-oriented area, professionals and para-professionals are being used to develop programs with small-farm families. The small farmer, caught up in a technological age, is faced with many problems which must be solved if he is to remain on the farm. Basic to most of his problems is the lack of real income brought about by the lack of knowledge of basic farm management techniques.

Extension's educational programs and personnel are uniquely qualified to equip the small farmer with knowledge of farm planning, land preparation and fertilization, livestock and poultry management, pest and disease control, and harvesting and marketing. However, since any efforts to improve the situation of the small-farm family must begin on a personal basis, more and more time is spent on person-to-person contacts. These contacts are being made in areas with concentrations of small farms and rural residents developing a small farms program. The primary objectives of these efforts are to improve farm efficiency by providing technological assistance, to increase family income through efficient production systems, and to improve living standards through increased knowledge.
Surveys of small farms in some areas point out that these operations need assistance with many problems, but becoming efficient with present enterprises is apparently the most urgent. To meet this demand the time-honored activity of conducting on-farm demonstrations is being used with some operators. These demonstrations have the distinct advantage of using the small farm problems and conditions, plus resources available on the farm including labor, equipment and investment potential.

Marketing

One of the serious problems small farmers have is selling their products. Low volume and lack of product quality work against marketing efficiency. The emphasis of special programs in this area has been to increase quantities by assembling products from several producers, giving public notice of sales, and improving quality by teaching producers accepted standards for product quality. Significant progress has been made in selected areas of the State, notably with feeder pig sales, contract marketing, roadside and co-op markets.

Greatest success for large numbers of small farmers of diverse kinds came from promoting small markets such as those now operating in most counties. These range in size and complexity from a designated place in a municipal parking lot to a 40-stall shed where farmers sell directly to customers. Since horticultural crops are produced in all counties, the establishment of direct-to-customer markets has sparked an estimated increase in farm revenue of $2 million annually, benefitting more than 1,000 small farmers.

Horticultural crops were also promoted with community-wide gardening programs in both adult and youth programs. Limited resource clients were assisted with vegetable production from site selection to harvest to food preservation.

Small Farm Project Management Team

Extension special programs cooperated with the Governor’s Division of Rural Development and Special Economic Assistance and other agencies in developing result demonstrations with horticultural crops in Anderson, Beaufort, Orangeburg and Charleston counties. These demonstrations were set up on small farms using production practices with special emphasis on trickle irrigation. Small farmer field days and tours were held at each site. The South Carolina Education Television Network filmed many of the steps involved in these projects to be used in developing future programs.
This division of Clemson University operates several consumer protection-type programs closely related to the agricultural sector. The philosophy for having regulatory programs at Clemson is that certain regulations can be enforced more effectively when strong educational approaches are used. Regulatory and Public Service Division personnel use this technique as a normal procedure.

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

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

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

The following report highlights the activities of the division during 1981-82.

**Department of Fertilizer Inspection and Analysis**


Some of the major activities of the department for the July 1, 1981-June 30, 1982 period follow:

- **Fertilizer usage data — tons**: 699,136
- **No. of fertilizer samples procured and analyzed**: 5,811
- **No. of fertilizer samples not meeting guarantee**: 1,237
- **Percent of fertilizer samples not meeting guarantee**: 21.3
- **No. of liming materials procured and analyzed**: 346
- **Total number of liming materials not meeting guarantee**: 16
- **Percent of liming materials deficient**: 4.6
- **Total number individual deficiencies in liming material samples**: 26
- **Number of irregularities other than underweight**: 2
- **Weight irregularities**: 7
Fines collected, payable to state treasurer .......... $ 405.00
Penalties collected, payable to state treasurer ....... 25,123.00
(Deficiencies where consumers not identifiable)
Fertilizer registration fees collected, payable to state treasurer ................. 10,720.10
Lime registration fees collected, payable to state treasurer ........... 910.00
Lime permit fees collected, payable to state treasurer ....... 2,390.00
Fertilizer taxes turned over to state treasurer ........ 181,158.20
Total monies sent to state treasurer ............ $220,706.30

* This is a first report. Final report may vary slightly.

Fertilizer Movement in 1981-82
The farm commodity price prospects and the economic picture had an effect on the fertilizer and agricultural limestone movement in South Carolina in 1981-82. Most farmers planned fertilizer use very carefully using soil tests as a guide. In many cases, this resulted in lower rates and the use of only those nutrients needed for the crop. Corn acreage was also reduced and soybean acreage increased. Since soybeans require less fertilizer, this further reduced tonnage. The total fertilizer tonnage was 699,136, down 19.7 percent for 1980-81 and less than any year since 1940-41.

Even though the tonnage of mixed fertilizer was lower, the total plant nutrient content was not reduced as drastically due to an increase in average analyses in recent years. The total plant nutrient tonnage in mixed fertilizer sold in 1981-82 was less than any year since 1960-61.

Fertilizer and Agricultural Liming Material Quality Control
The department procured 5,811 official fertilizer samples of which 21.3 percent were found to be deficient beyond allowed investigational allowances. Even though this is the identical value found in 1980-81, no year has been lower since 1976-77. Many companies improved their records while others had trouble. The department worked with companies in a number of ways in an effort to assure customers of guaranteed content.

Only 4.6 percent of 346 agricultural liming material samples were found to be deficient beyond allowed tolerances. The enforcement of the Agricultural Liming Materials Act has improved the quality of lime offered to South Carolina farmers.

Soil Amendments
Soil amendments are products advertised to increase yields or quality of crops or plants but do not contain recognized plant nutrients. A regulation passed by the General Assembly in 1979 requires such products to be
registered. To date, no products have been registered. Several products were ruled to be exempt since manufacturer's claims did not classify the material as a soil amendment. When distributors were found to be making such untrue claims, the sale of the product was declared illegal. This was done for the protection of consumers, but the action produced strong protests by some distributors and their legislative representatives.

**Plant Pest Regulatory Service**

**The Crop Pest Act**

*Nursery Inspections*: A total of 639 nurseries, greenhouses and vegetable transplant growers and 896 nursery dealers was licensed to sell plant material, including 28 out-of-state dealers. Three hundred and fifty-six additional establishments were visited on routine inspections to determine compliance with quarantines and regulations and to provide assistance with pest problems. Seventeen nurseries were not certified on the initial inspection because of pests or weed problems.

*Sweet Potato Inspections*: Seventy-four inspections, including storage, plant bed and field inspections, were conducted for about 25 growers in the Pee Dee, Sandhills and Coastal Plains areas of the state. Regular and certified seed stock was involved.

*Phony Peach*: Over 1.3 million peach trees were inspected in commercial orchards for the presence of phony peach disease. In 1981, 1,241 diseased trees were destroyed as compared to 944 the previous year.

*Japanese Beetle*: A portion of Abbeville County and all of Calhoun County were placed under quarantine as a result of trapping records during the summer of 1981.

*Sweet Potato Weevil*: Live adult weevils were found at the USDA/SEA Vegetable Breeding Laboratory in Charleston and appeared to be associated with internal cork virus research material stored over the winter. A small number of weevils have been found the last several years and Plant Pest Regulatory Service personnel are working closely with USDA researchers to eliminate the problem. This situation poses no threat to commercial production areas in the state.

*Miscellaneous Inspections*: One hundred and fourteen “Phytosanitary Export Certificates,” 59 state and 55 federal, were issued for various agricultural planting seed, oak lumber, flue-cured tobacco, and plant material, primarily orchids and chrysanthemum and rhododendron cuttings, destined to other states, Canada and other foreign countries. Thirty-one foreign countries were involved. Thirty-five regular “Certificates of Plant Inspection” were issued for tobacco seedlings, rose cuttings, peach budwood, sweet potatoes, tea plants, blueberry plants and assorted house-plants being moved or shipped within the United States and to Canada. Eleven states were involved.

Tobacco plant bed inspections were performed for six growers who had made applications for shipment to North Carolina.
Bee Disease Act

Of the 1,688 bee colonies inspected, 11 were infected with disease. Seven colonies were infected with chalkbrood disease and four each manifested symptoms of American and European foulbrood. Four hundred and sixteen other beekeeper contacts were made regarding various problems. Certification was issued to move 241 colonies to North Carolina and Georgia.

Cooperative State-Federal Programs

Gypsy Moth: In 1981, 327 adult male moths were trapped state-wide as compared to 68 in 1980. Again, the majority were trapped in Horry County in the campground areas. Adults were also trapped for the first time in Beaufort, Cherokee, Greenville, Jasper, Orangeburg, Richland and York counties.

Three egg masses, three pupal skins and two larval skins were found during a survey conducted by USDA, Animal and Plant Health Inspection Service (APHIS), South Carolina Commission of Forestry and Plant Pest Regulatory Service personnel at Little River. Live larvae were also found this spring when preparations were begun for a sterile release control program. This program was being conducted and funded by the USDA and APHIS. An additional egg mass survey was performed in York County where multiple moth catches were made in a commercial campground. Results were negative.

Approximately 10,000 Christmas trees were inspected at 34 dealer establishments throughout the state for gypsy moth egg masses and scleroderris canker with negative results. Trees from the northern states were the primary target.

Imported Fire Ant: Approximately 100 mounds were found through survey at a relatively new shopping mall in Greenville. The infestation was definitely linked to infested plant material used to landscape the mall. All evident mounds were treated and contact was made with the landscape contractor responsible for insect control on the outside plantings. Periodic survey of the area is still being conducted.

Witchweed: Ninety-five properties totaling 1,729 acres were released from quarantine. Statistics compiled by USDA and APHIS indicated that three new farms encompassing 419 acres were found infested with witchweed. A total of 7,778 acres received one or more herbicide applications for control purposes for an aggregate of 17,967 acres treated.

Mediterranean Fruit Fly: A State quarantine was adopted on an emergency basis July 17, 1981, because of the Mediterranean fruit fly infestation in California. Medfly traps were placed at farmers markets in Greenville and Columbia as well as at the major food chain warehouses in the state that received direct shipments from California. Incoming trucks carrying regulated articles were checked at the above location for a two-week period with spot checks thereafter. No medflies were detected and
the quarantine was not renewed after the time period elapsed. Aerial spray treatments began in California and regulated articles were being certified for shipment by USDA, APHIS and California State personnel under the federal quarantine.

**Boll Weevil:** The South Carolina Boll Weevil Eradication Act of 1976 was amended to provide for a grower referendum to determine if an eradication program against the boll weevil would be implemented beginning July 1982. Eight cotton producer meetings were held throughout the State to acquaint and explain the eradication program and the mechanics of the referendum to the growers. The referendum ballots were mailed through the USDA, Agricultural Stabilization and Conservation Service on February 24, 1982, with a return postmark by March 5, 1982 necessary for voting eligibility. The referendum failed because the % voting majority for passage was not obtained. Results of the returns were 63.74 percent in favor of the program.

**South Carolina Pesticide Control Act**

In an effort to compensate for a continuing decrease in state appropriated monies, this agency has pursued external sources of funds where such funds can be obtained without hindering our State pesticide program. These efforts have resulted in two grants from EPA totaling $121,611. The department has also made a concerted effort to increase efficiency by instituting a number of changes, including a new vacuum method of taking formulation samples saving 50 percent of the cost of the previous method.

**Registration:** In 1982, a total of 739 companies registered 6,000 pesticide products for sale in South Carolina. The number of pesticide samples collected and analyzed was 2,031 with 46 (2.3 percent) found deficient in the guaranteed percentage of one or more ingredients. Compared to 1981, the number of deficiencies decreased by 0.5 percent. Stop sale notices were issued on all deficient products. Registration fees totaling $105,181.25 were deposited.

Utilizing provisions of the Federal Pesticide Control Act, the department issued 27 Section 24(c), special local need registrations. Five Section 18, emergency exemptions, were issued for: (1) the use of Pydrin to control tomato fruitworm in coastal counties; (2) the use of Ambush and Pounce to control loopers on soybeans; (3) the use of Ectiban to control northern fowl mites on poultry; (4) the use of Fusilade and Poast to control Johnsongrass in cotton; and (5) the use of Larvadex to control fly larvae in and around poultry houses.

**Certification:** Pesticide dealers and applicators must be certified and licensed in order to sell, purchase and/or apply pesticides classified for restricted use by the Environmental Protection Agency. In 1982, the following licenses were issued: 12,334 private applicators, 1,289 commer-
cial applicators, 691 noncommercial applicators and 528 pesticide deal-

ers. Certification fees totaling $43,749.50 were deposited.

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

Education and Enforcement: Pesticide personnel made the following
personal contact during 1982: 1,725 pesticide dealers, 200 county agents,
200 commercial applicators, 50 aerial applicators, 110 noncommercial
applicators, 25 private applicators, 30 manufacturers, 775 pest control
operators and 675 miscellaneous contacts.

A total of 421 structural pest inspections were conducted. The pro-
mulagation of comprehensive structural pest control regulations in August
of 1980 has significantly increased the workload in this area but is
providing a valuable service to both the industry and the consumer.
Although strong enforcement measures have been required in a few
instances, such as a $4,000 civil penalty for one firm, most pest control
companies are voluntarily correcting violations and refunding charges for
unnecessary pest control activities.

Forty-two investigations of potential pesticide misuse were conducted
in 1982, with the two major problems being drift of pesticides onto non-
target sites and coastal county fish kills resulting from runoff from treated
fields. No misuse of pesticides was involved in the fish kills. The other
major enforcement area involved pesticide dealers who were not comply-
ing with regulations governing the storage, display and sale of pesticides.

Numerous “stop sale” notices were issued for unregistered products,
sale of restricted use products by unlicensed dealers and other violations
of the act.

Comprehensive investigations of “flim-flam” pest control activities
resulted in the arrest and incarceration of several people who for years
have consistently caused problems. An excellent working relationship has
been established between the agency and the Consumer Fraud and the
Consumer Affairs sections of the Attorney General’s office. Overall,
compliance with the act by members of the agribusiness industry has been
excellent.

Department of Agricultural Chemical Services

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

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

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

Departmental field work in 1981-82 involved inspections of 81,656 acres of crops for certified seed production. Inspections included 79 varieties of 12 crops for 315 farmer-growers and 31 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 in the program were soybeans, 53,475; small grains, 21,257; and cotton, 5,091. Cotton acreage has continued to decline and was the smallest acreage certified in the 36 year history of the program. Other field work involved grow out plantings of 246 samples of South Carolina certified soybeans for comparison to producer or processors’ samples of the same seed lots. This work clearly indicated the excellent job certified seed producers and processors are doing in obtaining representative samples of their seed.

During 1981-82, some 1,397,973 certified seed tags were issued to growers whose seed met field standards and seed purity and germination standards when analyzed in the laboratory. Thirty-eight facilities were inspected and approved during the year for custom processing of South Carolina certified seed.

Though yields of crops for certified seed production were reduced by drought in some areas, the yield reductions were not as widespread or as severe as in 1980-81. The supply of certified seed of the various crops available was more than adequate, and no serious seed quality problems were experienced with any crops during the year.
The Livestock-Poultry Health Division conducts a number of regulatory programs in the fields of consumer protection and animal health and the diagnosis of various disease problems in South Carolina livestock.

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

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

The following highlights the activities of this division during 1981-82.

**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.

In July 1981, 17 meat and poultry establishments operating under the Talmadge-Aiken program were turned over to the federal government due to a 7 percent reduction in our state personnel services budget. In February 1982, an additional budget reduction almost resulted in turning over the remainder of the South Carolina program to the federal government, but funds eventually were made available which made it possible for Clemson University to continue the programs.

One hundred and fourteen plants are currently under state inspection using an inspection staff of 55 employees. South Carolina's programs continue to meet the standards to be classified as "equal to" the Federal Meat and Poultry Inspection Programs.

**Cooperative Disease Eradication Programs**

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

During the year, the U. S. Department of Agriculture approved the shipment of six Hannoverian horses into South Carolina under quarantine for intensive testing. These horses came from foreign countries where contagious equine metritis is known to exist. All horses were found to be free of the disease and were released from quarantine.

In July 1981, South Carolina was declared by the U. S. Department of Agriculture to be a bovine tuberculosis-free State. It qualified by having
gone five years without a confirmed case of tuberculosis being reported in cattle.

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

**Animal Diagnostic Laboratory**

The laboratory is staffed by six veterinarians and eleven technicians. It provides diagnostic services in animal pathology, bacteriology, virology and serology for the regulatory programs as well as diagnostic help to practicing veterinarians and livestock and poultry owners in the State. The laboratory is in a position to isolate and identify many animal diseases impossible to differentiate clinically.

On April 1, 1982, the laboratory began charging a fee of $10 per sample for tumor classification, including tests for feline leukemia.