

College of Agricultural Sciences and Natural Resources

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The College of Agricultural Sciences and Natural Resources is the academic arm of the Division of Agricultural Sciences and Natural Resources, and offers outstanding undergraduate and graduate programs that are recognized at the state, regional, national and international levels. In collaboration with the Oklahoma Cooperative Extension Service (OCES) and the Oklahoma Agricultural Experiment Station (OAES), the College of Agricultural Sciences and Natural Resources (CASNR) provides great breadth and exceptional quality in teaching, advising, outreach, research and service. Undergraduate and Graduate students have come to expect and receive academic programs of excellence in CASNR.

Career opportunities in Agriculture and Natural Resources are highly diverse. Majors are supported in the very traditional agricultural and natural resource areas such as animal science, crop science, and agricultural education, emerging areas such as plant and animal biotechnology, food science, and communications, and many fields not commonly associated with agriculture such as turf management, biochemistry, environmental science, leadership and pre-medical sciences. As a result of this wide variety of majors, CASNR students come from both traditional agricultural roots and urban settings. This diversity adds strength to the college experience for all CASNR students. Active international programs are available to students in every CASNR major and add a unique dimension to the college experience.

In 2006, a new department was created to serve students interested in natural resources. The Department of Natural Resource Ecology and Management (NREM) brings together programs in forestry, wildlife, fisheries and rangeland ecology, and fire ecology. Students studying in these areas have many common interests and career goals. Graduate programs are available in these areas and departmental faculty has research interests to complement their teaching responsibilities.

The College of Agricultural Sciences and Natural Resources prepares students to analyze information, communicate effectively, think critically, problem solve, and assume leadership roles in their respective fields of study. Students also receive a solid general education in communications, humanities and social sciences. In agriculture or natural resources, the graduate will have an opportunity for a rewarding career that will last as long as food is consumed, fiber is grown and soil, water and wildlife resources are valued.

Accreditation

Agricultural Sciences and Natural Resources include broad and diverse professions and do not have a single accrediting society as do some other professions. Programs in agricultural education, agricultural engineering, forestry, landscape contracting and landscape architecture are accredited by their professional organizations.

Academic Programs

Undergraduate Programs. The Bachelor of Science in Agricultural Sciences and Natural Resources degree is offered in the following major fields of study: agribusiness, agricultural communications, agricultural economics, agricultural education, agricultural leadership, animal science, biochemistry and molecular biology, entomology, environmental science, food science, horticulture, landscape contracting, natural resource ecology and management, and plant and soil sciences. The Bachelor of Landscape Architecture is also offered in the College of Agricultural Sciences and Natural Resources.

Graduate Programs. Graduate study is available in all academic departments in the College. In addition to the Master of Agriculture and Master of Science degrees that may be obtained through several departments, the Doctor of Philosophy degree (PhD) may be earned in the following areas: agricultural economics, agricultural education, biosystems engineering, animal breeding, animal nutrition, biochemistry and molecular biology, crop science, entomology, food science, plant pathology, soil science, natural resource ecology and management and in horticulture through interdisciplinary programs in crop science, environmental science, and plant science.

High School Preparation and Admission Requirements

The high school preparation and admission requirements for the College are the same as the general University requirements. A solid background in English, algebra, and natural science is important preparation for the many academic programs in the various agricultural disciplines.

Transfer Students

Students who transfer from an accredited college or two-year college must meet the general University admission requirements. All transferred courses are recorded on the OSU transcript; however, no more than 60 hours from a two-year college will be used to meet the College's degree requirements. Specific departmental requirements needed for graduation are determined by the department in which the student plans to earn his or her degree.

Scholarships

Students enrolled and entering the College of Agricultural Sciences and Natural Resources were awarded over \$900,000 in scholarships by the College and its departments for the 2009-2010 academic year. The following areas are considered in the awarding of scholarships: scholastic standing in high school or college; leadership qualities which have been shown in school, church, community or youth groups; financial need; sincere interest in the various agricultural disciplines.

Additional information may be obtained from the Office of the Associate Dean, College of Agricultural Sciences and Natural Resources, Oklahoma State University, 136 Agriculture Hall, Stillwater, OK 74078. Applications are available at www.casnr.com.

Academic Advising

All students in the College have the advantage of being advised by a faculty member working in the individual student's academic discipline. Academic advisers are readily available to students and work closely with the students throughout their academic careers.

Special Academic Programs

Honors Program. The Honors College through the College of Agricultural Sciences and Natural Resources is designed to provide outstanding students with opportunities to pursue new challenges and academic excellence. Honors courses, seminars, and special honors contracts provide for discussions and independent study by students who have the desire and ability to explore academic subjects beyond the normal class work material. Honors awards available in the College are:

1. General Education Honors.
2. Departmental Honors.
3. The bachelor's degree, with honors.

Awards (1) and (2) may each be earned independently of one another. Award (3) is earned by satisfying the requirements of both (1) and (2). The completion of each award is noted on the student's transcript. Students who complete all three receive the bachelor's degree with honors diploma.

All entering freshmen who have ACT composite scores of 27 and a high school GPA of 3.75 or better, are eligible to become a part of The Honors College. Sophomores, juniors, and seniors, with minimum cumulative grade-point averages of 3.30, 3.40, and 3.50, respectively, may enroll in The Honors College. Additional information may be obtained from the director of The Honors College, 101 Old Central.

Pre-Veterinary Medicine Curriculum. Specific pre-veterinary science majors in Agribusiness, Animal Science, Biochemistry and Molecular Biology, and Entomology, as offered in the College of Agricultural Sciences and Natural Resources, includes all courses required for admission to the Center for Veterinary Health Sciences.

Applicants must have completed at least 60 semester hours and have a minimum grade-point average of 2.80 in the required courses listed below (applicants must have satisfied all academic requirements by the last day of the spring term of the year in which admission is desired):

English composition (6 hours minimum):

ENGL 1113 and 1213; or 1313 and 1413.

Technical report writing or English elective (3 hours minimum).

Inorganic chemistry and lab (8 hours minimum):

CHEM 1314 and 1515.

Organic chemistry and lab (5 hours minimum):

CHEM 3015 (or 3053, 3153, and 3112).

Biochemistry (3 hours minimum): BIOC 3653.

Mathematics (3 hours minimum):

MATH 1513 (or any higher level mathematics).

Physics (4-8 hours minimum): PHYS 1114 and 1214.

Animal nutrition (3 hours minimum): ANSI 3543.

Biological science (8 hours minimum): BIOL 1114 and ZOOL 1604.

Microbiology and Lab (5 hours minimum): MICR 2123 and 2132.

Genetics (minimum 3 hours):

ANSI 3423 or PLNT 3554 or BIOL 3023.

Humanities/Social Sciences (6 hours minimum).

Although these course requirements may be completed within two years, most pre-veterinary medicine students complete at least three years of preparatory course work or a bachelor's degree. For more information on application requirements, refer to the "Center for Veterinary Health Sciences" section in the *Catalog* and the current brochure, *OSU Veterinary Medicine Admission Requirements*. Students are also encouraged to contact the Office of the Assistant Dean for Academic Programs in the College of Agricultural Sciences and Natural Resources.

General Education Requirements

The College of Agricultural Sciences and Natural Resources is committed to providing graduates both a depth of knowledge in their chosen field of study as well as breadth of knowledge outside their major. General education requirements are the same as those of the general University. Specific course offerings are given in the respective plans of study.

Graduation Requirements

General University requirements for graduation are stated elsewhere in the *Catalog*. In addition, specific requirements must be met for the Bachelor of Science in Agricultural Sciences and Natural Resources and Bachelor of Landscape Architecture degrees. For the BS degree, the required total semester credit hours vary by department, major and option. A minimum of 40 semester credit hours and 100 grade-points must be earned in courses numbered 3000 or above. The Bachelor of Landscape Architecture is a five-year program requiring 160 credit hours.

College and Departmental Clubs, Organizations and Honor Societies

Agricultural Communicators of Tomorrow
 Agricultural Education Graduate Student Association
 Aggie-X Club (agricultural economics)
 Agricultural Ambassadors
 Agronomy Club
 Alpha Epsilon
 Alpha Tau Alpha (agricultural education honor society)
 Alpha Zeta (college honor society)
 American Fisheries Society
 American Society of Agricultural & Biological Engineers
 Biochemistry Club
 Biochemistry & Molecular Biology Graduate Student Association
 Block and Bridle Club (animal science)
 CASNR Student Council
 Collegiate Farm Bureau
 Collegiate 4-H
 Collegiate FFA (agricultural education)
 Cowboy Motorsports
 Cowboys for Christ
 Dairy Science Club
 Environmental Science Club
 Food Industry Club
 Freshmen in Transition
 Golf Course Superintendent's Assoc. of America
 Horseman's Association
 Horticulture Club
 Leadership League
 Meat Science Association
 Oklahoma Collegiate Cattlewomen
 Pi Alpha Xi
 Plant and Soil Sciences Graduate Student Organization
 Pre-veterinary Science Club
 Professional Landcare Network
 Rodeo Association
 Sanborn Entomology Club
 Sigma Alpha
 Sigma Lambda Alpha (horticulture and landscape architecture)
 Society of American Foresters/Forestry Club
 Society of Landscape Architects
 Society for Range Management
 Soil and Water Conservation Society
 Turf Club
 Wildlife Society
 Xi Sigma Pi (Forestry Honor Society)

Agricultural Communications

Robert Terry, Jr., PhD, Professor and Head

Modern agriculture, with its diversity and specialization, requires accurate communication between industry leaders and the public. Education in agricultural communications prepares students to provide the necessary communications link.

By majoring in agricultural communications, students gain renaissance communications education with classes in advertising and public relations, Web design, magazine writing and production, radio and television broadcasting, photography, reporting and newswriting, or research report writing. Opportunities also are available for the student to develop a double-major program with other departments in the College of Agricultural Sciences and Natural Resources.

For the graduate with a bachelor's degree in agricultural communications, career opportunities are abundant in the agricultural production industry and in service organizations as well as with publishing firms, broadcast stations, trade publications or related media.

Graduate Programs

The Master of Science degree in agricultural communications is designed to build mastery of knowledge in key areas such as communication theory, history, philosophy, computer technology, advanced communication skills and research and data analysis. The Master of Science degree in agricultural

communications reflects the distinctive body of knowledge, research base, professional delivery and program focus of the discipline. In addition, the program introduces and requires students to apply research tools and methods.

The Master of Science program serves two primary purposes: (1) encouraging mastery of discipline-specific knowledge with an introduction to research and data analysis and (2) offering discipline-specific knowledge with professional application to the work setting.

The Master of Science program offers students two options for completion of the degree: thesis option and formal report option. The thesis option requires 30 approved credit hours of course work, which includes a six credit hour formal thesis following the graduate college format. The formal report option requires 32 approved semester credit hours of course work, which includes a two credit hour formal report.

Students applying for the Master of Science program without a background in the appropriate option will be expected to complete course work to bring their preparation to the appropriate level.

Admission Requirements. All students accepted into the agricultural communications Master of Science degree program will be expected to meet all University and Graduate College requirements and to have earned a degree in agricultural communications or related field from an accredited university. Applicants from outside agricultural communications will be required to complete prerequisite courses equivalent to the knowledge and competencies expected in the agricultural communications undergraduate program.

An undergraduate grade-point average of 2.80 overall on a 4.00 scale or 3.00 in the last 30 hours is required. The applicant must complete the Graduate Record Examination, submit a statement of goals for pursuing the master's degree and submit letters of reference from at least three people knowledgeable of the applicant's professional qualifications. These references should include statements relating to (a) the applicant's success in professional settings or commitment to professionals allied with the disciplines in the College of Agricultural Sciences and Natural Resources, (b) the applicant's prior academic record as a reflection of ability to succeed in a Master of Science program, and (c) the applicant's potential for success in research, writing and course work at the Master of Science level. If such references are not available, the applicant should submit references from one or more faculty members familiar with the applicant's academic career. Other references should be from individuals capable of addressing the applicant's ability to successfully complete a Master of Science program.

Review Process for Admission. The Office of the Associate Dean of Graduate Studies manages all procedures and records pertinent to admission. The admission process is ongoing with admission recommendations rendered by the graduate faculty in agricultural communications and agricultural education. To be eligible for committee review, each applicant must submit an application for admission to the Graduate College, transcripts of all academic records, reference letters, goal statement and GRE scores.

Agricultural Economics

Michael D. Woods, PhD, Professor and Head

The Department of Agricultural Economics at Oklahoma State University offers programs of study leading to the BS, MS, MAg and PhD degrees in agricultural economics and the BS degree in agribusiness. Agricultural economics and agribusiness curricula study the economic relationships among individuals, firms and service agencies in agriculture and between the agricultural sector and other sectors of the economy. The department's courses emphasize the economic issues and concepts associated with producing, processing, marketing, and consuming agricultural goods and services and those used in the industry.

Undergraduate programs in agricultural economics and agribusiness combine instruction in technical agricultural sciences with education in the application of economic and business management principles and tools. The agricultural economist or agribusiness person draws upon the physical and social sciences to outline, understand, and solve economic problems created by agriculture's dynamic operating environment. Curricula in the Department of Agricultural Economics emphasize the decision-making and problem-solving skills used in the management of agricultural production and marketing firms.

Study in agricultural economics or agribusiness prepares students to excel in many challenging careers. Many graduates work to improve food production

and processing throughout the world. Other graduates work with government policies that affect the food and fiber sector. Others assist rural communities to adjust and thrive in the rapidly changing world. Graduates also help protect and maintain natural resources and the environment for the greatest benefit of society. Many graduates choose career paths that lead them far from the farm.

Agricultural Economics. The agricultural economics BS degree trains students to analyze problems and make decisions using a solid framework of economic and business principles. Study plans may be tailored to a wide variety of career interests. In addition to a base agricultural economics BS degree plan, the agricultural economics student can choose from two degree options: international agricultural marketing and double major with accounting. In addition, the base agricultural economics degree plan offers specializations in quantitative studies, environmental and natural resources, and community and regional analysis. Each of the study plans in agricultural economics equips students for a variety of employment opportunities at competitive salaries in private industry and government agencies.

Agribusiness. Like the agricultural economics degree the agribusiness BS degree trains students to analyze problems and make decisions using a solid framework of economic and business principles. In addition, the agribusiness degree targets the skills needed for careers in agribusiness firms, including all areas of food and fiber production, processing, and marketing. In addition to the base agribusiness degree plan, students may choose from seven degree options: farm and ranch management, agribusiness management, agribusiness marketing, agribusiness finance, plant and soil science, pre-law, or pre-veterinary business management. Agribusiness students also may develop a minor area of study or a double major by selecting various course electives. Employment opportunities for agribusiness graduates are widely diverse, including jobs with farms, agricultural advisers, processing firms, wholesalers and retailers of food and fiber products, farm input supply firms, banks and other financial services firms, utilities and educational institutions.

Graduate Programs

The department offers graduate work leading to the Master of Science, the Master of Agriculture and the Doctor of Philosophy degrees. Both thesis and non-thesis options are available at the MS level. PhD students complete a teaching practicum in addition to the research thesis as a part of the degree requirements.

The graduate program stresses development of superior professional competence, suited to the demands of the modern business, academic, government and research environments. Advanced courses concentrate on economic analysis applied to problems of production, distribution and consumption of agricultural products. Courses in economic theory, econometrics, mathematical economics and statistics are an integral part of the program. Primary data analysis, natural resource use, international trade, planning, policy, and development are also important topics.

The faculty give direction and individual guidance to student research in marketing, production, management of agricultural enterprises, demand and price analysis, land and water use and development, non-market valuation, rural development and planning, agricultural finance, international trade, farm appraisal, agricultural policy, econometrics, and experimental economics. Students specialize through course electives and research topics. In addition, an advisory committee guides each student in preparing the program of study to ensure that the student's background, graduate course work, and research program together lead to the desired depth and breadth of proficiency.

Admission Requirements. Prerequisites to advanced training in agricultural economics are (1) the desire to understand and solve the complex and changing economic problems faced by agriculture and rural society, and (2) the desire and ability to learn methods of rigorous logical analysis.

In addition, differential calculus, statistics, and intermediate macro- and microeconomic theory constitute a minimum background for advanced study in agricultural economics. In certain cases, a part of this work can be taken after admission but will not count towards a graduate degree.

Acceptance by an adviser in the department is not required prior to admission to the departmental graduate program.

Agricultural Education

Robert Terry, PhD, Professor and Head

The programs of study offered in agricultural education are designed to provide both comprehensive and specialized training to prepare graduates for careers in a wide range of fields of agriculture. In addition to being prepared for licensure as teachers, graduates are professionally prepared for work in cooperative extension and other federal and state programs and services, as well as international education endeavors. Graduates also may find employment as educational directors and consultants with agribusiness firms and organizations. Studies may culminate in the BS, MA, MS or PhD degrees.

The undergraduate teaching option is designed to qualify the bachelor's degree recipient for the Oklahoma Agricultural Education Teaching License. This license is recognized as meeting requirements for initial employment as a teacher in most states. Graduates look forward to careers ranging from agricultural education teacher and cooperative extension educator to agricultural sales, marketing and production positions. Some students find it advantageous to elect a dual major, thus meeting requirements in both agricultural education and another major within the College of Agricultural Sciences and Natural Resources. The undergraduate agricultural education major is structured to provide educational experiences in general education, agriculture and professional education.

Graduate Programs

Graduate programs in agricultural education are designed to (1) prepare students for entry into or advancement in teaching careers and (2) provide for further development of professional leadership skills for other educational careers in agriculture, agribusiness, government service, extension, or adult education. To meet the needs of both international and domestic students, plans of study are developed for academic excellence specific to students' career goals. The selection and organization of courses are made in consultation with the adviser and the student's advisory committee.

The Master of Agriculture is offered to further knowledge and skills of agriculture and education in preparation for and advancement in teaching, extension administration and other professional areas. The Master of Agriculture program requires 32 approved semester credit hours of course work, including a two-credit-hour creative component, which may involve curriculum, teaching methods, research literature review or some similar area.

The Master of Science develops the theoretical and research foundation for further graduate studies in addition to further knowledge and skills in agriculture and education. It is designed primarily for those students interested in research. Two options are offered in the Master of Science program. The thesis option requires 30 approved credit hours of course work, which includes a six-credit-hour formal thesis following the graduate college format. The formal report option requires 32 approved semester hours of course work, which includes a two-credit hour formal report.

The Doctor of Philosophy program is designed to prepare graduates for careers in professional education, supervision, administration, curriculum development and other areas of professional leadership in agriculture, agricultural extension, career and technology, and agricultural communications. Within the minimum 60 credit hour requirement, 15 credit hours must be completed in agricultural education. In addition, 15 credit hours must be completed in an area of specialization such as agricultural extension, technical agriculture, educational administration, or other similar areas. The additional hours include 15 hours of research design and statistics and 15 hours for the dissertation.

Admission Requirements. Students seeking admission to the master's degree program must have earned a bachelor's degree in agricultural education, agriculture or education. A student with background deficiencies must compensate for such deficiencies before completing the masters degree. Evidence of academic ability (2.80 GPA or above) in undergraduate course work is required. Three letters of reference and a statement of purpose are also required. Graduate Record Exam (GRE) scores are required for students seeking admission to the Master of Science degree program.

Admission to the doctoral degree program is based upon evidence that the applicant meets the general requirements of the Graduate College, has demonstrated superior achievement, and can successfully complete a doctoral program as evidenced by three letters of recommendation, GRE scores, a minimum of 2.80 undergraduate grade-point average and 3.00 graduate grade-point average, three years of successful professional experience, and a philosophy statement and goals. Alternative criteria may be considered by the graduate committee for those who submit ample supportive evidence of other exemplary qualifications.

Agricultural Leadership

Robert Terry, PhD, Professor and Head

With its far-reaching impacts, the agricultural industry needs strong leaders. The ever-increasing intricacies of the agricultural industry make it all the more important to have employees in the industry who understand the technical aspects of agriculture as well as the human aspects. The Agricultural Leadership major provides an opportunity for students to prepare as generalists in agricultural sciences and natural resources while developing a strong understanding of leadership theory and its application. Agricultural Leadership graduates seek careers in extension, politics, governmental agencies, non-profits, corporate agriculture, higher education and small business.

The Agricultural Leadership curriculum at Oklahoma State University is guided by five core values: commitment to agriculture, authentic leadership, diversity, critical thinking and professionalism. Agricultural leadership faculty align course objectives, learning opportunities and student experiences with the five core values. Beginning students study historical and theoretical foundations in leadership, authentic leadership and transformational leadership before exploring contemporary leadership issues, leadership program facilitation and current scholarship in the discipline. Specific topics within course work include leadership styles, power, decision-making, ethical leadership, motivational theories and team processes.

In addition to leadership course work, the curriculum provides a broad introduction to the agricultural sciences and natural resources and allows students to develop an area of emphasis or pursue a minor in areas such as animal science, soil science or agricultural economics.

Minor in Leadership Education. The minor is designed to prepare students to serve as leadership educators within the context of their chosen major. Students explore career options in leadership education, develop an understanding of their own leadership style and philosophy, acquire knowledge about leadership theories, explore contemporary issues in leadership, evaluate current leadership research and learn to design and facilitate leadership training. Requirements of the minor include 17 hours of leadership course work, including six hours of controlled electives.

Graduate Programs

Students may pursue graduate studies in agricultural leadership through the Master of Agriculture in Agricultural Leadership or the department's Doctor of Philosophy or Master of Science in agricultural education. The Master of Agriculture degree in Agricultural Leadership is an advanced studies program for practitioners seeking to develop their knowledge related to leadership and its application to the agricultural industry. Graduates pursue careers in extension, government, corporate agriculture, and human resources and training. The Master of Agriculture program requires 32 approved semester hours of course work including a 17 hour area of emphasis. Graduate course work in agricultural leadership includes leadership theory and practice, developments in agricultural and extension education, and a creative component. More information on graduate studies in agricultural leadership is available under Agricultural Education graduate programs.

Agriculture

Edwin L. Miller, PhD, Professor and Associate Dean

Graduate Programs

The Master of Agriculture degree is designed for students interested in graduate professional training with a strongly applied research orientation. The degree is offered in the following specialization areas: agribusiness, agricultural economics, agricultural education, agricultural leadership, animal science, entomology, horticulture, natural resource ecology and management, plant pathology, plant science, and soil science. New to CASNR is the interdisciplinary option, international agriculture.

Purpose. The purpose of this degree is to provide a program which will give additional specialization in technical fields, as well as increased breadth of training. Students who are interested in working toward the PhD degree should follow the regular Master of Science degree program.

Character of Program. This program will provide a greater breadth of study than the Master of Science program. Emphasis will be given to practical application of the technical aspects of the discipline as well as discipline interrelationships. The principal focus, however, is on an applied research concept and a broader program than is normally available with the specialized research degree.

Admission Requirements. A baccalaureate degree in agriculture or a related field is required for admission. The candidate must meet requirements for acceptance into the Graduate College and be recommended by the departmental graduate committee responsible for the program.

Degree Requirements. The requirements for this degree are the same as those listed in the *Catalog*, "Graduate College" section, under "The Master's Degree."

In addition, each candidate approved for study under this program will be assigned an adviser and advisory committee with whom he or she will develop a plan of study in accordance with guidelines established in the department. A preliminary plan of study must be approved by the Office of the Associate Dean for Academic Programs and must be filed in the Graduate College Office prior to enrollment for the 17th credit hour. Departmental comprehensive final examinations will be required of all Master of Agriculture candidates.

Degree Options.

Option A Requirements. A total of 32 approved semester credit hours of work, including an approved report having a credit hour value of not more than two credit hours, is required.

Option B Requirements. A total of 36 approved semester credit hours of work is required and must contain a creative component. No report is required.

Option C Requirements. A total of 36 approved semester credit hours of work, including six hours of credit for a professional internship, is required. The internship includes professional practice and a report.

Animal Science

Ronald Kensinger, PhD, Professor and Head

Animal science is concerned with the science, art and business of the production of beef cattle, dairy cattle, horses, poultry, sheep, swine and pets/companion animals. An animal scientist is concerned with the application of the principles of the biological, physical and social sciences to the problems associated with domestic animal production and management.

Animal science is also concerned with the products of food. The food industry is one of the largest and most important industries in the United States. Food scientists are concerned with the processing, safety, quality control and marketing of food.

Undergraduate students may elect to pursue a Bachelor of Science degree in the department by majoring in either Animal Science or Food Science. Internship programs providing three to six months of off-campus work experience are available in all Animal Science options and are part of the curriculum for Food Science. Participation in undergraduate clubs (Block and Bridle, Dairy Science, Horsemen's Association, Food Science, Meat Science, Oklahoma Collegiate Cattlewomen) or judging teams (livestock, meats, horses, or dairy cattle) improves social, communication and leadership skills. Participation in judging teams and academic quadrathlon programs, including honors programs, provides excellent training opportunities.

Animal Science. Undergraduate students may elect study emphasis programs in the areas of animal biotechnology, business, international, livestock merchandising, pre-veterinary animal science, production, and ranch operations, or a double major with agricultural communications or with agricultural education. In addition, students have the opportunity to concentrate their studies on one or more animal species.

Students interested in veterinary medicine may complete the pre-veterinary medicine requirements at the same time they are working toward a BS degree in animal science. In addition, pre-vet students gain valuable insight into the care and management of animals throughout the animal science curriculum.

Undergraduate students follow a similar curriculum during the first two years which includes basic courses in the physical, biological and social sciences, and a series of introductory courses in agriculture and business. Upper-class students take a basic core of advanced animal science courses, including genetics, physiology, and nutrition. As seniors, students complete a series of advanced animal science courses which are designed to apply knowledge obtained in previous courses to livestock systems. Every opportunity is taken in teaching to utilize the excellent herds and flocks owned or operated by the department.

Students completing a degree with a major in animal science have a wide choice of challenging careers, including ownership or management of farms, ranches, feedlots; employment with state and federal agencies concerned with inspection, grading or regulation; banking and financial activities, sales and service positions with companies involved with feeds, pharmaceuticals or

other animal products; biotechnology; opportunities in agricultural extension or teaching; and work in the processing, distributing and merchandising of dairy, poultry and meat products.

Food Science. Food Science is an applied field. A Food Scientist is someone who applies the basic sciences: biology, physics, chemistry, and mathematics to further our understanding of the factors that affect food quality, safety, and nutrition. Food science is applied to the selection, preservation, processing, packaging, distribution, and use of safe, nutritious, and wholesome foods.

There are two study emphasis programs in the Food Science major: Science and Industry.

The Science emphasis gives students a well-grounded background in chemistry, physics, mathematics and biology as well as food science. Students who elect this option usually have a primary interest in science and will be prepared to enter graduate education programs in food science.

This Science emphasis is also an excellent choice for students interested in professional schools such as Medical School, Dental School, Pharmacy, Physical Therapy and Veterinary Medicine. Students who elect not to pursue a graduate degree or a professional degree are prepared to work in any facet of the food industry, especially those jobs focused on research, product development and food analysis.

The Industry emphasis provides a basic understanding of the chemical and physical processes of food processing. Students pursuing this option are prepared to enter food plant management, quality assurance, quality control, product development and sales.

Graduate Programs

The Department of Animal Science offers graduate work leading to the Master of Science degree in animal science or food science. Research work at the MS level is available in the areas of animal breeding (genetics), animal nutrition, animal physiology or food science (meat or milk products). A Master of Agriculture degree in the emphasis area of animal science is also available. The department offers programs leading to the Doctor of Philosophy degree in animal science or food science.

Prerequisites. Admission to the graduate program requires an undergraduate major in animal science, dairy science or poultry science, or in closely-related biological sciences or biochemistry. In addition, students with a major in dairy manufacturing, microbiology, human nutrition, food science, or food technology can qualify for the program in food science. A student enrolling in a degree program must have been accepted by an adviser prior to official admission. In all cases, the student's graduate adviser or committee may recognize specific undergraduate deficiencies and require measures to attain proficiency.

Biochemistry and Molecular Biology

Gary A. Thompson, PhD, Professor and Head

Biochemistry, the central scientific discipline linking the chemical, physical and biological sciences, exerts a profound influence on the progress of medicine and agriculture. By applying concepts and methods of chemistry and physics to the fundamental problems of biology, biochemists have made great progress in their effort to understand the chemistry of living organisms. Major discoveries concerning the biochemistry of genetic material provide the tools of molecular biology that are essential to contemporary life sciences research.

Biochemists and molecular biologists are concerned with living things. They must acquire some knowledge of the biological sciences. Since a biochemist's tools are the physical sciences, he or she must receive sound education in mathematics, physics and chemistry.

Challenging positions for well-trained biochemists and molecular biologists are available in colleges and universities, state and federal laboratories, research institutes, medical centers and in an increasing number of industrial organizations, particularly the pharmaceutical and food industries. Biochemists are involved with research on the chemistry of processes occurring in plants, animals, and various microorganisms, and with the discovery and development of antibiotics, vitamins, hormones, enzymes, insecticides and molecular genetics techniques.

At the undergraduate level a major in biochemistry and molecular biology administered by the Department of Biochemistry and Molecular Biology is available through the College of Agricultural Sciences and Natural Resources. The department also offers a BS degree in biochemistry through the College of Arts and Sciences. An honors program is available. The curriculum provides a broad background in chemistry and biological science and permits flexibility

in meeting particular interests of the student. Courses in biochemistry are based on general, organic and analytical chemistry. The biochemistry and molecular biology curriculum provides students with sufficient background in the basic sciences of mathematics, physics, chemistry and biology to meet the needs for graduate study in most fields of modern science related to either agriculture or medicine and other allied health programs. The curriculum is excellent for pre-professional students. The department's research activities provide opportunities for part-time employment of undergraduate majors to improve their professional competence.

Graduate Programs

Because many of the opportunities in biochemistry require advanced course work, a major part of the program in the Department of Biochemistry and Molecular Biology is concerned with its graduate program leading to the MS or PhD degree. This graduate program is an integral part of extensive basic research activities in the Oklahoma Agricultural Experiment Station.

Prerequisites. Although the BS in chemistry or biochemistry is preferred, students with strong backgrounds in other biological or physical science disciplines are eligible. Individuals not having at least eight semester credit hours each of organic chemistry and calculus plus four credit hours each of analytical and physical chemistry must take appropriate undergraduate courses to make up deficiencies. The results of the three general GRE exams (verbal, quantitative, analytical) are required for entrance. An advanced GRE subject matter exam (biochemistry, chemistry or biology) is also recommended. A GRE score of 500 verbal, 650 quantitative and 4.0 analytical is normally required.

Degree Requirements. A more detailed description of the graduate study program in biochemistry is available from the department upon request. The requirements listed below complement the general graduate requirements described in the "Graduate College" section of the *Catalog*. After the first semester, continuous attendance and participation in the departmental seminar is expected.

The Master of Science Degree. Twenty-four credit hours of formal graduate courses are required, including BIOC 5753, 5824, 5853, and 5930. In addition, a student must present an acceptable research thesis (six hours) and pass a final oral examination covering it and related material. Research advisers are selected at the end of the first semester.

A non-thesis Master of Science degree is also available. It does not require a research thesis, but requires a report and extensive technical training in the laboratory. The non-thesis MS is not recommended for students wishing to pursue a PhD later.

The Doctor of Philosophy Degree. The course requirements are determined with the aid of the student's graduate advisory committee. Usually they follow these guidelines: total of 30-40 credit hours of formal graduate course work which includes all the courses listed for the MS degree, at least four of the advanced graduate courses in biochemistry (6000 level). Additional course requirements, appropriate to the student's interests, are determined by the advisory committee. The advisory committee is selected at the end of the second semester. Each student will take a series of preliminary examinations in January of his or her third semester.

One year of a foreign language at the college level is required. The student must present, and defend in a final oral examination, an acceptable research thesis which contains a substantial original contribution to the field of biochemistry. The department offers research experience in a variety of areas of biochemistry.

Biosystems and Agricultural Engineering

Randal K. Taylor, PhD, PE, Professor and Head

The Department of Biosystems and Agricultural Engineering is administered jointly by the College of Agricultural Sciences and Natural Resources and the College of Engineering, Architecture and Technology.

Biosystems engineers are professionals who create and adapt engineering knowledge and technologies for the efficient and effective production, processing, storage, handling and distribution of food, feed, fiber and other biological products, while at the same time providing for a quality environment and preserving and protecting natural resources. Biosystems engineers directly address problems and opportunities related to food, water, energy, and the environment - all of which are critical to the quality of life in our society. Subject-matter specialization is provided through the following four undergraduate option areas: biomechanical, bioprocessing and biotechnology, environment and natural resources, and food processing.

Biosystems engineering courses integrate engineering sciences, physical sciences, and biological sciences, and teach students to address real-world challenges. With the guidance of experienced faculty, students work both as individuals and in teams to design creative solutions to complex problems.

The undergraduate biosystems engineering degree program provides the comprehensive education necessary to prepare students for successful, productive and rewarding careers in engineering for agricultural, food and biological systems. Graduates of the program will be:

- able to apply mathematical, physical, engineering, and biological principles needed to understand, analyze and solve problems in food, agricultural, environmental and/or biological systems.
- effective in oral, written and visual communication.
- effective in accomplishing tasks, both as an individual, and as a contributor to multi-disciplinary teams.
- able to understand the social, environmental, safety and economic impacts of their work in local and global contexts, and to perform in a professional and ethical manner.
- committed to enhancing knowledge and skills through continuing education.

The undergraduate educational program is divided into two components—pre-professional and professional. In the pre-professional portion of the biosystems engineering program (usually equivalent to two years of study) the focus is on the underlying biological, physical, chemical and mathematical principles of engineering, supplemented by appropriate general education courses in English, social sciences and humanities. Students who demonstrate proficiency in this portion of the program are eligible for admission to the professional school in biosystems engineering.

The professional school of biosystems engineering curriculum (typically two years) builds systematically upon the scientific knowledge acquired in the pre-professional curriculum. In professional school, students have the opportunity to focus on the option areas given above. The degree is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology under agricultural engineering and similarly named programs.

Each professional school course builds upon preceding engineering courses to develop in the student the ability to identify and solve meaningful engineering problems. The course work is specifically sequenced and interrelated to provide design experience at each level, leading to progressively more complex, open-ended problems. The course work incorporates the social and economic aspects of technical problems, and stresses the responsibilities as engineering professionals to behave ethically and promote occupational and public safety. The program culminates in senior year design courses in which students integrate the analysis, synthesis and other abilities they have developed throughout the earlier portions of their study into a capstone experience. At this point, they are able to design components, systems and processes that meet specific requirements, including such pertinent societal considerations as ethics, safety, environmental impact and aesthetics. The students have also developed and displayed the ability to conduct experiments essential to specific studies and to analyze the experimental results and draw meaningful conclusions.

An integral part of this education continuum from basic science through comprehensive engineering design is learning experiences that facilitate the students' abilities to function effectively in both individual and team environments. Moreover, the program provides every graduate with adequate learning experiences to develop effective written and oral communication skills. State-of-the-art computational tools are introduced and used as a part of their problem-solving experiences. Finally, the students' experiences in solving ever-more-challenging problems enable them to continue to learn independently throughout their professional careers.

A wide variety of employment opportunities are available for biosystems engineers in industry, public service and education. Some of these opportunities include positions in governmental agencies, consulting engineering firms, and agricultural and food equipment industries. Biosystems engineers are employed throughout the U.S. as well as internationally.

Students interested in a degree in biosystems engineering may initially enroll in the College of Agricultural Sciences and Natural Resources or the College of Engineering, Architecture and Technology. Students who enroll in the College of Agricultural Sciences and Natural Resources should request a biosystems engineering adviser and transfer to the College of Engineering, Architecture and Technology by the end of their first semester.

Graduate Programs

The Department of Biosystems and Agricultural Engineering offers programs leading to the Master of Science and Doctor of Philosophy degrees in Biosystems Engineering. These degrees emphasize research and development.

Excellent laboratory and computer facilities are available for students to explore research and design in such areas as bioprocessing and food engineering, machine vision, sensor and control technology, waste management and utilization, hydrology, water quality, porous media flow, and intelligent systems for agricultural production.

Research projects are supported by the Agricultural Experiment Station and by state, federal and private grants and contracts. A well-trained faculty, many of them registered professional engineers with research, consulting and design experience, guide the graduate students' activities and plan programs to meet students' needs. Graduate students design experiments and special equipment to conduct their work. They are expected to demonstrate, by supporting research or by designs, the ability to identify a problem, define alternatives, propose a solution, organize a design or an experimental investigation, carry it to completion and report the results.

Admission Requirements. Admission to either the Master of Science or Doctor of Philosophy degree program requires graduation from an engineering curriculum accredited by the Accreditation Board for Engineering and Technology. Students without accredited degrees may be admitted provisionally and may be required to take additional courses. A student must be accepted by an adviser in the department prior to official admission to the graduate program.

Degree Requirements. A candidate for the graduate degrees listed above follows an approved plan of study which must satisfy at least the minimum University requirements for that particular degree.

Entomology and Plant Pathology

Phillip G. Mulder, Jr., PhD, Professor and Head
Carmen Greenwood, PhD, Undergraduate Coordinator
Brad Kard, Graduate Coordinator

The mission for the Department of Entomology and Plant Pathology is to discover, develop and disseminate science based knowledge concerning arthropods and plant pathogens. Entomology is the science and study of insects and related arthropods. Plant Pathology is the science and study of bacteria, viruses, fungi and nematodes that cause diseases in plants. A strong academic background in the physical and biological sciences is essential for success in both disciplines. Research and education programs range from basic studies of cellular, physiological and genetic aspects to broad ecological and population studies and focus on the development of practical pest management strategies.

The undergraduate program in entomology leads to the BS in Entomology and offers students opportunities to explore the diversity of nature through the study of arthropods and their interactions with plants, animals and human culture. Specialized course work in entomology includes insect identification, biology, ecology, physiology, biochemistry, population dynamics, medical and veterinary entomology and insect pest management.

Plant pathology as a discipline encompasses the science required to understand the causes of plant diseases as well as prevention and controlling diseases. Undergraduate level courses are available in Plant Pathology and are valuable additions to programs in entomology, horticulture, agronomy, ecology and botany. Specialized course work in plant pathology includes pathogen identification, genetics, host-parasite physiology, biotechnology, molecular genetics and disease management.

There are many, and diverse, career opportunities for graduates of these programs, including positions involved with pest management in crops and livestock production, stored products such as grains and processed foods and protecting structural systems such as houses from termites and agricultural biotechnology. Undergraduates of the entomology program are prepared to enter graduate programs in several disciplines, including entomology and have been successful in medical and veterinary programs. Others gain employment with private industry, research laboratories or county, state or federal agencies. Some develop their own businesses as consultants and/or entrepreneurs.

Graduate Programs

The Department of Entomology and Plant Pathology offers programs of study that lead to the MS of Entomology and Plant Pathology, the PhD in

Entomology or the PhD in Plant Pathology. These programs offer students opportunities to specialize in a wide range of basic or applied research fields. To qualify for graduate study in entomology and/or plant pathology an applicant should obtain a solid background in the basic sciences, especially biology, chemistry, mathematics, English and communications skills. All requirements of the Graduate College must be satisfied for entry to the graduate programs. In addition, applicants for graduate programs should take the Graduate Record Examination and submit their scores. Students applying to the graduate program must be accepted into a research program by a major professor. The applicant must secure appropriate financial support in the form of a scholarship, fellowship or graduate assistantship to be negotiated with the major professor and department and be approved by the departmental screening committee and department head before being admitted to the Graduate College. Each graduate student is under the direction of the major professor as adviser and a selected faculty advisory committee. The program of study will be adapted to the individual's needs within the departmental and Graduate College guidelines. Graduate students are required to meet with their advisory committees every six months for program reports and examinations. Each student will follow a program of study and research approved by the student's committee and, except for the Master of Agriculture degree, must submit an approved thesis or dissertation and present a public defense. Students supported as half-time research assistants are expected to be active participants in the research projects of their major professors. Additional information regarding the graduate programs in Entomology and Plant Pathology may be obtained from the Department's Web site at: www.ento.okstate.edu.

Environmental Sciences

Brian J. Carter, PhD, Professor and Director

The College of Agricultural Sciences and Natural Resources offers an undergraduate major in environmental sciences. This interdisciplinary program is designed to improve the current and future welfare of the human race through understanding environmental policies based on scientific principles in accordance with the true benefits and costs as evaluated by an informed society.

As an interdisciplinary and science-oriented major, the student takes courses in biology, chemistry, math, physics, statistics, and social sciences. The student may choose one of three areas of emphasis (options): environmental policy, natural resources, or water resources. Depending on the option, upper-division course work will involve problem-solving work in water and soil quality, economic and social policy, political science, resource management and engineering. The student will also be exposed in general education subjects, including communications, philosophy, ethics and sociology.

A primary goal is to enable graduates to solve environmental problems based on scientific principles and in accordance with society's needs. Successful completion of this major the student earns the Bachelor of Science in Agricultural Sciences and Natural Resources.

The environmental sciences undergraduate major is directly supported by faculty from the departments of Agricultural Economics, Biosystems and Agricultural Engineering, Entomology and Plant Pathology, Horticulture and Landscape Architecture, Natural Resource Ecology and Management, and Plant and Soil Sciences. The major and its students also benefit from working in and out of the classroom or laboratory with faculty who are conducting cutting-edge research related to environmental problems through the Freshman Research Scholars Program.

Graduates work in such areas as land-use planning, environmental management, natural resources management, waste disposal, water and soil quality, environmental remediation and policy analysis. Industries associated with the extraction, utilization and manipulation of natural resources have increased the number of employees with environmental training to address regulation compliance, litigation, monitoring, public relations and management practices.

Graduates may also work with federal, state and local government agencies involved in regulation, resource management and policy development. Graduates, particularly those who have gone on to earn advanced degrees, find employment with consulting firms that are involved with solving environmental problems. Many graduates go on to graduate school or pursue a degree from a professional school, such as law or medicine.

Horticulture and Landscape Architecture

Dale M. Maronek, PhD, Professor and Head

Horticulture is the science, business and art associated with the culture, production, preservation and processing of flowers, trees, shrubs, turfgrass, vegetables, fruits and nuts. It also includes the proper environmental use and maintenance of plants in the landscape. Thus, horticulture is involved with the production and processing of a significant part of the nation's food supply, it involves production and landscape environmental and sustainability applications, and provides a major source of the beauty in and around homes, cities, parks, highways, golf courses and other public areas.

Today, horticulture requires highly trained and capable people to help meet the food demands of society and to be involved in activities that lead to a better quality of life and improved environment. The horticulture student must have a good understanding of plant biology and commercial production/maintenance, environmental and business practices.

Educational opportunities for study in horticulture cover a wide variety of plants and subjects and range from the cellular to the whole plant level. Factors such as nutrition, irrigation, genetics, propagation, control of flowering, and fruit and seed production are considered in their relationship to culture, production, conservation of resources, harvesting, processing and storage. Students can prepare themselves for careers in public grounds administration (arboreta, parks and zoos), golf course management, horticulture business, environment and sustainability areas, sales and marketing, production, teaching, extension and research.

The training that the student obtains is related to the specific area of emphasis that is chosen. Regardless of one's interest, objectives, or area of emphasis, a good knowledge and understanding of horticulture is a necessity. A student can receive a BS degree and choose from the following four options:

Horticulture Science emphasis is on preparing students for science-based careers, including laboratory science or graduate study. This option provides the training and expertise for production maintenance and preservation of fruits, nuts, vegetables, nursery crops, flower crops, etc. Training can be general or be chosen to emphasize a particular commodity area of horticulture. Students learn plant care techniques and the role plants and landscape applications play in sustaining the environment.

Horticulture Business option features opportunity to combine horticulture with principles of running a business. A built-in requirement for a formal academic minor in a business area is a feature of this option.

Turf management provides the training for turfgrass production and for management of turfgrass in golf courses, parks, athletic fields, home landscapes, airports and along highways.

Public horticulture emphasizes the administration, leadership, and management of public gardens and their diverse operations. This four-year program is one of a very few in the United States and is appropriate for individuals interested in careers in arboreta, botanic gardens, zoos, horticultural societies, park systems, museums, habitat creation and restoration (especially disturbed areas and/or wetlands) civic garden centers, and other public sector institutions. Students complete a well-rounded selection of horticulture courses and courses in business management, design, ecology, leadership, education and botany. The option can also lead to graduate study. Students have the opportunity to be involved in the OSU Botanical Garden and the department's television show, *Oklahoma Gardening*.

After the BS degree is completed, a qualified student may choose to pursue a graduate degree, specializing in any option. Students from other departments may also choose to pursue a formal academic minor in horticulture.

Landscape architecture as a field deals with the planning and design or arrangement of natural and artificial elements on the land through preservation of existing natural and synthetic resources, and through application of cultural and scientific knowledge.

Landscape architecture is the study of design of outdoor spaces, with supporting courses in art, construction, ecology, horticulture, environmental sciences and social science in a five-year professional program leading to the Bachelor of Landscape Architecture (BLA) degree. The BLA degree is accredited by the American Society of Landscape Architects. Typical employers include landscape architecture firms, architectural engineering firms and government agencies dealing with land planning, environmental and conservation applications, urban planning, parks and recreation.

In an effort to maintain an effective balance between students, faculty, and facilities, enrollment in the fourth and fifth years of the program is limited to

15 students each. Students will be evaluated during their third year by the faculty in order to select the most qualified candidates based upon academic achievement and professional potential. Minimum requirements may vary each year; however, a student must have completed a minimum of 60 credit hours.

Landscape contracting is a program that emphasizes the construction and management phases of landscape development, including plants, environmental applications, and structures. It is a four-year program leading to an accredited BS degree. The degree is accredited by the Professional Landcare Network. Course work includes basic landscape architectural design, construction technology, business and horticulture. Students may emphasize either landscape construction or landscape management. Graduates are employed by landscape contracting companies, design-build firms, landscape maintenance companies, landscape nurseries, and governmental agencies.

Graduate Programs

The department offers programs of study leading to the degrees of Master of Science in horticulture (with areas of specialization in horticultural science, landscape architecture, phytochemistry and turfgrass science), Master of Agriculture with specialization in horticulture, and participates in multidisciplinary PhD programs in crop science, environmental science, food science, and plant science. Areas of study include floriculture crops, fruit and nut crops, vegetables, ornamental nursery crops, and turf. In addition to commodity-oriented specialities, students may emphasize food processing, environmental applications, plant extraction applications, postharvest physiology, or stress physiology disciplines. Applicants should indicate their interest area(s). Research opportunities range from whole plant production/management studies to fundamental cellular studies. Additional information on programs, application procedures, and financial assistance is available at: www.hortla.okstate.edu/graduate/.

Prerequisites. Admission requires a bachelor's degree in horticulture, landscape architecture, or a related field with at least a 3.00 ("B") grade-point average. Students with course work deficiencies in fundamental areas may be required to take remedial courses to attain proficiency in accordance with the advisory committee's guidance. In addition to Graduate College requirements, applicants must submit official GRE scores, a statement of research and career interests, and three letters of reference.

Admission to the program requires approval by the graduate committee, a departmental adviser on the Graduate Faculty, the department head, and Graduate College. The program of study and research will be directed by the student's graduate adviser and advisory committee.

Natural Resource Ecology and Management

M. Keith Owens, PhD, Professor and Head

Faculty in the Department of Natural Resource Ecology and Management (NREM) have expertise in conducting interdisciplinary instruction, research, and extension education which focus on the natural resources of fisheries, forests, rangeland, and wildlife within and beyond the boundaries of Oklahoma. Increased public understanding of the ecology and management of these natural resources which are important in agriculture, hunting and fishing, ecotourism, forest production and use, as well as the conservation of wildlife habitat is an important goal of the faculty in NREM.

The NREM faculty support undergraduate and graduate programs in fire ecology, fisheries, forestry, rangeland, and wildlife. The NREM curriculum prepares students to plan, implement, and research the management, protection, and sustainable use of natural resources within Oklahoma and throughout the world. The department provides an integrated education in renewable natural resource management, conservation, and utilization, as well as a valuable perspective for understanding and solving critical contemporary environmental problems at local, regional, and global scales.

NREM Degree Options.

Fire Ecology and Management option was developed in response to the need for understanding the ecological role and management of wildland fire in natural ecosystems, and the importance and implementation of prescribed fire in land management. This option offers students the opportunity to accomplish specific land management objectives through the proper use of prescribed fire. The curriculum combines experience with prescribed fire plans, policy and law, weather, equipment, conducting prescribed burns, and post-burn management. In addition, students will be assisted in completing federal fire training requirements.

Fisheries and Aquatic Ecology is an option designed for students with interest in the management of fish populations and habitats. Courses offer research techniques and methodology in fisheries science, including sampling design, habitat measurements, sampling techniques and abundance estimation, age and growth analysis, recreational surveys, data analysis and report writing.

Forest Management emphasizes the biological, political, and managerial skills needed to ensure the sustainability of the many renewable forest resources on which society depends. Successful completion of the curriculum will provide competency in the general areas of basic science, forest biology, forest mensuration, forest economics, natural resource policy, decision-making and problem solving, and communications.

The **Urban and Community Forestry** option produces graduates who are able to assess ecological and biological characteristics of the forest in an urban environment, the managerial and political context within which forest management takes place, as well as direct involvement in resource management or in specialized supporting roles in areas such as urban planning and environmental education.

Forest Conservation Resource emphasizes the science-based conservation and management of forest lands, ecosystems and related natural resources. Students gain the skills that are necessary for the measurement, assessment, and valuation of natural resources and the evaluation of management strategies for forest and related wildlands.

The **Forest Management and Forest Conservation Resource** options are accredited by the Society of American Foresters (SAF). SAF is recognized as the specialized accrediting body for forestry programs in the U.S. Requirements for these options include the successful completion of two, three-week field camps in May, which are scheduled to follow the sophomore and junior years, and are held annually in diverse forest settings. Past summer camps have been held across the U.S. Field forestry skills, forest ecology, integrated natural resource management, and state-of-the-art operations are emphasized at camp.

The **Rangeland Ecology and Management** program emphasizes understanding management of grasslands, shrub lands, and forests for forage and habitat production. This includes the effects of grazing, fire, and other disturbances on biotic and abiotic processes. Students learn to integrate their knowledge of soil, water and vegetation attributes into management of public or private wild lands for multiple uses.

The **Wildlife Ecology and Management** option provides insight into the biological basis for management of wildlife populations and habitats, with emphasis on current management problems. This option combines research techniques, including aging and sexing, wildlife and vegetation sampling, and wildlife population and habitat analysis with the methodology of wildlife science.

The **Natural Resource Communications** option allows students to gain knowledge and expertise in the various natural resource disciplines represented in the department combined with the skills necessary to compete in the world of communication. Students are allowed to choose from a variety of courses in forestry, fisheries, fire ecology, rangeland ecology and management, and wildlife while at the same time taking courses in media and strategic communication.

Courses in these programs fulfill the requirements for many other applied and professional careers in the natural resource disciplines, including preparation for graduate programs and certification with the Society of American Foresters, The Wildlife Society and The American Fisheries Society. Graduates may be employed by governmental agencies, non-profit organizations, private agencies or individuals. Federal agencies hiring NREM graduates include U.S. Department of Agriculture, U.S. Forest Service, U.S. Bureau of Land Management, U.S. Geological Survey, U.S. Fish and Wildlife Service, Agricultural Research Service, Bureau of Indian Affairs, National Park Service, Animal and Plant Health Inspection Service, and the Natural Resources Conservation Service. In addition, state, county, and municipal governments employ NREM graduates in a variety of resource management consultant, restoration, service, and technical positions.

Students entering the NREM department are encouraged to join and become active members of one of the many student organizations: Society of American Foresters, Society for Range Management, The Wildlife Society, and the American Fisheries Society. Participation in one or more of these organizations provides students the opportunity to attend state, regional, or national meetings where they will gain valuable advantages through networking, student competitions, and interacting with various career-related activities.

Graduate Programs

The Department offers the MS and PhD degrees in Natural Resource Ecology and Management with specializations in Fisheries and Aquatic Ecology, Forest Resources, Rangeland Ecology and Management, and Wildlife Ecology and Management. In addition, students may work toward the MS and PhD degrees in the Environmental Science Graduate Program and the PhD degree in the Plant Science Graduate Program with faculty members from the Department.

The overall goals of the Department are to provide high quality advanced training and instruction in the application of the scientific method to problems in natural resource ecology and management. This includes problem analysis and identification, research methods, synthesis of results and communication of findings. The Department strives to develop the capability for original and creative work under the guidance of established professionals and scientists. Graduate instruction is a critical component of the research, instruction and extension missions of the Department.

Students work directly with a member of the faculty to design a program of study to serve individual career goals. The prerequisite for graduate study in the Department is a bachelor's degree in an area aligned with the student's research interests with a minimum overall GPA of 3.00. Please refer to the Web site <http://nrem.okstate.edu> for a full description of the application process. A student must be accepted by a member of the Department's faculty prior to official admission to the program.

Plant and Soil Sciences

David R. Porter, PhD, Professor and Head

The mission for the Department of Plant and Soil Sciences is to discover, develop, and disseminate knowledge that advances the management, sustainability, and restoration of plant and soil ecosystems. The goal of the department is to meet societal needs for food, fiber, energy, and intrinsic value related to the conservation and management of plant and soil resources. Teaching, research and extension efforts are designed to assist decision makers in matters regarding land management.

Undergraduate students select an option of study from: agribusiness, bioenergy production, forage and livestock production, plant biotechnology, plant science, soil geotechnology or soil and water resources. Targeted topics a student may choose to pursue include: crop production, precision agriculture, plant genetics, soil conservation, soil chemistry, soil fertility, weed science, or waste management. Options of study provide flexibility for students to work with their academic advisers to develop a plan of study to suit their interests. Upon completion of their education, students are encouraged to pursue professional certification available in their respective areas of expertise.

The knowledge base regarding land management continues to grow as the department's internationally recognized research faculty, discovers new information. Emerging issues in plant breeding and genetics, biotechnology, plant physiology, crop production, applied landscape ecology, weed science, weed ecology, soil nutrient management, soil chemistry, soil physics, invasive species management, and land restoration assist decision makers in finding solutions that sustain natural resources and are economically viable. Many undergraduate students work with the research faculty on projects providing the student an opportunity to assist in gathering new information.

Upon completion of a Bachelor of Science program, students are employed by private firms, public institutions, state and federal agencies, or non-profit organizations that require personnel with expertise in plant and soil systems. Typical careers include: federal employment in soil and rangeland conservation; crop consulting; technical sales and service for seed, fertilizer or agricultural chemical supply companies; farm or ranch operation; research positions as plant and soil scientists with federal agencies, state agricultural experiment stations or private industries; teaching and extension positions with colleges and universities; and a broad range of employment or ownership in retail businesses supplying feed, seed, grain, fertilizers, equipment, agricultural chemicals and other agricultural supplies and services. Demand for individuals with experience in plant and soil sciences will continue as long as society demands a safe, secure food supply balanced with a desire to conserve natural resources.

Graduate Programs

Programs of course work and research are offered leading to the Master of Agriculture in the emphasis area of plant and soil sciences and the Master of Science degree in plant and soil sciences. The Doctor of Philosophy degree can be attained in crop science, environmental science, plant science, and soil

science. Specific programs are available in the areas of plant breeding and molecular biology, biotechnology, forage management, weed science, crop physiology, soil morphology and genesis, soil microbiology, soil fertility and plant nutrition, soil physics, soil-water management, soil chemistry, and waste management. Applicants should indicate their specific area of interest upon application.

The graduate programs in plant and soil sciences prepare individuals for successful careers in a variety of areas, including farming and ranching, extension education, agricultural business, research, teaching, environmental sciences, waste management, and all aspects of crop production.

Prerequisites. Admission to the graduate program requires a BS degree in plant and soil sciences, agronomy or a closely related field. Applicants should have completed basic courses in plant and soil sciences, agronomy, biology, chemistry and mathematics required of undergraduate majors. Deficiencies in fundamental course requirements will be met by the student with the direction of the student's advisory committee. Applicants must be accepted by an adviser in an appropriate discipline prior to official admission.

Degree Requirements. Students must follow approved plans of study that meet the minimum University and program requirements for the respective degrees they are pursuing.

The Master of Science degree in plant and soil sciences may be earned by using the thesis option. This plan requires a minimum of 30 credit hours of course work, including six credit hours of PLNT, or SOIL 5000, master's thesis.

The Master of Agriculture degree may be earned by utilizing one of three options:

Option A—Formal report (non-thesis), minimum of 32 credit hours of course work, including two credit hours of PLNT or SOIL 5000, master's thesis.

Option B—Minimum of 36 credit hours of course work and a creative component.

Option C—Minimum of 36 credit hours of course work including six hours of credit (PLNT or SOIL 5230, Research) for a professional internship.

The internship will consist of professional practice and an informal report. Internships for students with previously established vocations and career experience must be in areas other than the specific vocational field of the students.

The degree plans of study for the Doctor of Philosophy degree in crop science, environmental science, plant science, and soil science are developed individually for each candidate. Doctoral programs in crop science and soil science require 60 credit hours beyond the MS degree, including a minimum of 15 credit hours of PLNT or SOIL 6000 (Dissertation). All students must meet certain requirements in basic disciplines such as statistics, mathematics, botany, and chemistry. Study of a foreign language is not required, but can be incorporated if the student and advisory committee feel that it is desirable. Degree plans for doctoral students in plant science that include molecular, organismal, or ecological programs of study, and in environmental sciences, that include a broad spectrum of soil, water, and waste management issues, are developed for candidates in conjunction with advisory committee approval.