ANIMAL SCIENCES, B.S.

Animal science students focus on the biology of domesticated animals, including cattle, goats, horses, poultry, sheep, swine, as well as meat derived from the traditional meat animal species. Some attention is directed toward the companion animal species, including dogs and cats. The major emphasizes integration of biological principles from the gene to the organ to the herd or flock. Core courses in the major include animal breeding, veterinary genetics, animal physiology, reproductive physiology, comparative animal nutrition, animal health, and meat science. Additional courses include career orientation, animal handling, assessing animal welfare, biology of companion animals, composition of meat animals, human/animal symbiosis, ruminant nutrition, monogastric nutrition, sheep production, beef cattle production, swine production, equine business, livestock production in agricultural development, and laboratory techniques in mammalian gamete and embryo biology.

The major offers a science track which includes math, physics, organic chemistry and biochemistry for students with interests in postgraduate work in veterinary medicine, medicine, animal science or other graduate programs. The major also offers a business emphasis which includes economics, accounting, marketing, farm management, commodity markets, agricultural finance, and other courses from the School of Business.

Career opportunities exist in the meat, artificial insemination, feed, agribusiness, agri-marketing and biotechnology industries. Occasionally, students have found positions within zoos. All students receive individualized attention from their academic advisor. The Department has several livestock- and meat-related scholarships. Internships and research experience are encouraged. Numerous graduates have completed double majors with Life Science Communication, Poultry Science, Genetics, and departments outside of CALS such as Spanish, according to the interests and aspirations of the student.

A student majoring in animal sciences is placed in the bachelor of science degree program. Completion of the degree program in four years is the norm.

HOW TO GET IN

To declare this major, students must be admitted to UW–Madison and the College of Agricultural and Life Sciences (CALS). For information about becoming a CALS first-year or transfer student, see Entering the College (http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#enteringthecollege).

Students who attend Student Orientation, Advising, and Registration (SOAR) with the College of Agricultural and Life Sciences have the option to declare this major at SOAR. Students may otherwise declare after they have begun their undergraduate studies. For more information, contact the advisor listed under the Advising and Careers tab.

UNIVERSITY GENERAL EDUCATION REQUIREMENTS

All undergraduate students at the University of Wisconsin–Madison are required to fulfill a minimum set of common university general education requirements to ensure that every graduate acquires the essential core of an undergraduate education. This core establishes a foundation for living a productive life, being a citizen of the world, appreciating aesthetic values, and engaging in lifelong learning in a continually changing world. Various schools and colleges will have requirements in addition to the requirements listed below. Consult your advisor for assistance, as needed. For additional information, see the university Undergraduate General Education Requirements (http://guide.wisc.edu/undergraduate/#requirementsforundergraduatetestudtext) section of the Guide.

COLLEGE OF AGRICULTURAL AND LIFE SCIENCES REQUIREMENTS

In addition to the University General Education Requirements, all undergraduate students in CALS must satisfy a set of college and major requirements. Specific requirements for all majors in the college and other information on academic matters can be obtained from the Office of Academic Affairs (http://www.cals.wisc.edu/academics). College of Agricultural and Life Sciences, 116 Agricultural Hall, 1450 Linden Drive, Madison, WI 53706; 608-262-3003. Academic departments and advisors also have information on requirements. Courses may not double count within university requirements (General Education and Breadth) or within college requirements (First-Year Seminar, International Studies and Science), but courses counted toward university requirements may also be used to satisfy a college and/or a major requirement; similarly, courses counted toward college requirements may also be used to satisfy a university and/or a major requirement.

COLLEGE REQUIREMENTS FOR ALL CALS B.S. DEGREE PROGRAMS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Quality of Work: Students must maintain a minimum cumulative grade point average of 2.000 to remain in good standing and be eligible for graduation.</td>
<td></td>
</tr>
</tbody>
</table>
Residency: Students must complete 30 degree credits in residence at UW–Madison after earning 86 credits toward their undergraduate degree.

First Year Seminar (http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#requirementstext)

International Studies (http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#requirementstext)

Physical Science Fundamentals 4-5

- CHEM 103 General Chemistry I
- or CHEM 108 Chemistry in Our World
- or CHEM 109 Advanced General Chemistry

Biological Science 5

Additional Science (Biological, Physical, or Natural) 3

Science Breadth (Biological, Physical, Natural, or Social) 3

CALS Capstone Learning Experience: included in the requirements for each CALS major (see "Major Requirements") (http://guide.wisc.edu/undergraduate/agricultural-life-sciences/#requirementstext)

MAJOR REQUIREMENTS

Courses may not double count within the major (unless specifically noted otherwise), but courses counted toward the major requirements may also be used to satisfy a university requirement and/or a college requirement. A minimum of 15 credits must be completed in the major that are not used elsewhere.

<table>
<thead>
<tr>
<th>Code/Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mathematics and Statistics</strong></td>
<td></td>
</tr>
<tr>
<td>Select one of the following (or may be satisfied by placement exam):</td>
<td>5-6</td>
</tr>
<tr>
<td>MATH 112 &amp; MATH 113</td>
<td>Algebra and Trigonometry</td>
</tr>
<tr>
<td>MATH 114</td>
<td>Algebra and Trigonometry</td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>3-4</td>
</tr>
<tr>
<td>STAT 301</td>
<td>Introduction to Statistical Methods</td>
</tr>
<tr>
<td>STAT 371</td>
<td>Introductory Applied Statistics for the Life Sciences</td>
</tr>
<tr>
<td>STAT/F&amp;W ECOL/HORT 571</td>
<td>Statistical Methods for Bioscience I</td>
</tr>
<tr>
<td><strong>Chemistry</strong></td>
<td></td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>5-10</td>
</tr>
<tr>
<td>CHEM 103 &amp; CHEM 104</td>
<td>General Chemistry I and General Chemistry II</td>
</tr>
<tr>
<td>CHEM 109</td>
<td>Advanced General Chemistry</td>
</tr>
<tr>
<td>CHEM 115 &amp; CHEM 116</td>
<td>Chemical Principles I and Chemical Principles II</td>
</tr>
<tr>
<td><strong>Biology</strong></td>
<td></td>
</tr>
<tr>
<td>Select one of the following:</td>
<td>13</td>
</tr>
<tr>
<td>Option 1:</td>
<td></td>
</tr>
<tr>
<td>BIOLOGY/BOTANY/ZOOLOGY 151</td>
<td>Introductory Biology</td>
</tr>
<tr>
<td>ZOOLOGY/BIOLOGY/BOTANY 152</td>
<td>Introductory Biology</td>
</tr>
</tbody>
</table>

| Option 2: | |
| ZOOLOGY/BIOLOGY 101 | Animal Biology |
| ZOOLOGY/BIOLOGY 102 | Animal Biology Laboratory |
| BOTANY/BIOLOGY 130 | General Botany |

| Option 3: | |
| BIOCORE 381 | Evolution, Ecology, and Genetics |
| BIOCORE 382 | Evolution, Ecology, and Genetics Laboratory |
| BIOCORE 383 | Cellular Biology |
| BIOCORE 384 | Cellular Biology Laboratory |
| GENETICS 466 | Principles of Genetics |

**Animal Sciences Core**

<table>
<thead>
<tr>
<th>Code/Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AN SCI/DY SCI 101</td>
<td>Introduction to Animal Sciences</td>
</tr>
<tr>
<td>AN SCI/FOOD SCI 305</td>
<td>Introduction to Meat Science and Technology</td>
</tr>
<tr>
<td>AN SCI/DY SCI/NUTR SCI 311</td>
<td>Comparative Animal Nutrition</td>
</tr>
<tr>
<td>AN SCI/DY SCI 320</td>
<td>Animal Health and Disease Management</td>
</tr>
<tr>
<td>AN SCI/DY SCI 361</td>
<td>Introduction to Animal and Veterinary Genetics</td>
</tr>
</tbody>
</table>

Select one of the following: 2

<table>
<thead>
<tr>
<th>Code/Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AN SCI/DY SCI 362</td>
<td>Veterinary Genetics</td>
</tr>
<tr>
<td>AN SCI/DY SCI 363</td>
<td>Principles of Animal Breeding</td>
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</table>

Select one of the following: 3

<table>
<thead>
<tr>
<th>Code/Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>AN SCI/DY SCI 373</td>
<td>Animal Physiology</td>
</tr>
<tr>
<td>AN SCI/DY SCI 434</td>
<td>Reproductive Physiology</td>
</tr>
</tbody>
</table>

**Animal Science Depth**

Select 12 credits from animal science depth courses 2 12

<table>
<thead>
<tr>
<th>Code/Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AN SCI 220</td>
<td>Growth, Composition and Evaluation of Meat Animals</td>
</tr>
<tr>
<td>AN SCI/DY SCI 313</td>
<td>Animal Feeds and Diet Formulation</td>
</tr>
</tbody>
</table>

**Emphasis**

Select an emphasis 24-25

<table>
<thead>
<tr>
<th>Code/Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AN SCI 435</td>
<td>Animal Sciences Proseminar</td>
</tr>
</tbody>
</table>

Total Credits 88-96

1 Science Emphasis students may choose to complete MATH 171 Calculus with Algebra and Trigonometry I and MATH 217 Calculus with Algebra and Trigonometry II in place of MATH 114 Algebra and Trigonometry and MATH 221 Calculus and Analytic Geometry 1.

2 A course cannot be used for credit in both the Core and Depth within Major sections.

DEPT COURSES

<table>
<thead>
<tr>
<th>Code/Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AN SCI 220</td>
<td>Growth, Composition and Evaluation of Meat Animals</td>
</tr>
<tr>
<td>AN SCI/DY SCI 313</td>
<td>Animal Feeds and Diet Formulation</td>
</tr>
</tbody>
</table>
EMPHASIS COURSES

SCIENCE EMPHASIS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 221</td>
<td>Calculus and Analytic Geometry 1</td>
<td>5</td>
</tr>
<tr>
<td>or MATH 217</td>
<td>Calculus with Algebra and Trigonometry II</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 103</td>
<td>General Physics</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 343</td>
<td>Introductory Organic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>BIOCHEM 501</td>
<td>Introduction to Biochemistry</td>
<td>3</td>
</tr>
<tr>
<td>or BMOLCHEM 503Human Biochemistry</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Select 9 credits from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CHEM 344</td>
<td>Introductory Organic Chemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>CHEM 345</td>
<td>Intermediate Organic Chemistry</td>
<td></td>
</tr>
<tr>
<td>MICROBIO 303</td>
<td>Biology of Microorganisms</td>
<td></td>
</tr>
<tr>
<td>MICROBIO 304</td>
<td>Biology of Microorganisms Laboratory</td>
<td></td>
</tr>
<tr>
<td>M M &amp; I/ MICROBIO/PATH-BIO 528</td>
<td>Immunology</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 104</td>
<td>General Physics</td>
<td></td>
</tr>
</tbody>
</table>

1 Meets CALS International Studies requirement.
2 PHYSIOL 335 Physiology can substitute for AN SCI/DY SCI 373 Animal Physiology in the An Sci Depth section only.

BUSINESS EMPHASIS

Up to two courses may be applied to Certificate in Business Mgmt. for Ag. & Life Sciences.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>A A E 215</td>
<td>Introduction to Agricultural and Applied Economics</td>
<td>3</td>
</tr>
<tr>
<td>or ECON 101</td>
<td>Principles of Microeconomics</td>
<td></td>
</tr>
</tbody>
</table>

Select one of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>M H R 305</td>
<td>Human Resource Management</td>
<td></td>
</tr>
<tr>
<td>GEN BUS 310</td>
<td>Fundamentals of Accounting and Finance for Non-Business Majors</td>
<td></td>
</tr>
<tr>
<td>GEN BUS 311</td>
<td>Fundamentals of Management and Marketing for Non-Business Majors</td>
<td></td>
</tr>
</tbody>
</table>

Select one of the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMOLCHEM 314</td>
<td>Introduction to Human Biochemistry</td>
<td></td>
</tr>
<tr>
<td>CHEM 341</td>
<td>Elementary Organic Chemistry</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM 501</td>
<td>Introduction to Biochemistry</td>
<td></td>
</tr>
<tr>
<td>A A E 320</td>
<td>Farming Systems Management</td>
<td>3</td>
</tr>
<tr>
<td>A A E 322</td>
<td>Commodity Markets</td>
<td>3</td>
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</table>

Select 9 credits from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>A A E 419</td>
<td>Agricultural Finance</td>
<td></td>
</tr>
<tr>
<td>ACCT I S 100</td>
<td>Introductory Financial Accounting</td>
<td></td>
</tr>
<tr>
<td>or ACCT I S 300</td>
<td>Accounting Principles</td>
<td></td>
</tr>
<tr>
<td>AGRONOMY/ HORT/SOIL SCI 326</td>
<td>Plant Nutrition Management</td>
<td></td>
</tr>
<tr>
<td>ECON/FINANCE 300</td>
<td>Introduction to Finance</td>
<td></td>
</tr>
<tr>
<td>M H R 300</td>
<td>Managing Organizations</td>
<td></td>
</tr>
<tr>
<td>MARKETING 300</td>
<td>Marketing Management</td>
<td></td>
</tr>
<tr>
<td>MATH 217</td>
<td>Calculus with Algebra and Trigonometry II</td>
<td></td>
</tr>
<tr>
<td>MATH 221</td>
<td>Calculus with Algebra and Trigonometry II</td>
<td></td>
</tr>
<tr>
<td>MICROBIO 303</td>
<td>Biology of Microorganisms</td>
<td></td>
</tr>
<tr>
<td>MICROBIO 304</td>
<td>Biology of Microorganisms Laboratory</td>
<td></td>
</tr>
<tr>
<td>PHYSICS 103</td>
<td>General Physics</td>
<td></td>
</tr>
<tr>
<td>SOIL SCI 301</td>
<td>General Soil Science</td>
<td></td>
</tr>
</tbody>
</table>

Total Credits 24

1 A A E 215 Introduction to Agricultural and Applied Economics not accepted as a prerequisite for some advanced Business courses. A A E 215 carries only QR-B credit if taken fall 2011 or later.

HONORS IN THE MAJOR

To earn Honors in the Major, students are required to take at least 20 honors credits. In addition, students must take AN SCI 681 Senior Honor Thesis and AN SCI 682 Senior Honors Thesis when completing their thesis project; please see the Honors in Major Checklist (http://
Learning Outcomes

1. **Knowledge and comprehension.** Our students develop the working vocabulary of an animal scientist, a working knowledge of the basic anatomy, biochemistry, physiology, and genetics of animal and meat biology, and the applied nutrition, breeding, product harvest and processing skills, necessary to manage animal production systems. Students demonstrate their knowledge through rigorous examination and demonstration through hands-on instructional laboratory activities.

2. **Analytical processing.** Our students develop the ability to reduce complex datasets and scientific information into meaningful relationships and correlations, and using the scientific literature, they can develop hypotheses to test the cause of predicted relationships using the scientific method. Students demonstrate these skills through a senior capstone experience and through individualized research opportunities and instructional activities.

3. **Integration for application.** When faced with real world problems which they have never confronted, our students are able to apply their knowledge to develop solutions. In addition, our students are capable of identifying problems yet to be investigated and in need of advanced study. The student's ability to integrate and apply their knowledge is demonstrated through our internship programs, animal related job experiences, club activities, and problems sets that students solve in exams and laboratory settings.

4. **Critical thinking.** Students find their sources of information using peer reviewed research articles. They learn not only to question popular press, but understand that even in the scientific literature there are contradictory findings. They have the capacity to synthesize scientific literature such that they can communicate a position backed with strong scientific support. These skills are demonstrated through the reading, writing and discussion of science-based papers in key courses during their educational process and through an oral presentation in their capstone course.

5. **Effective communication.** Students graduate from our department with the ability to communicate, both in writing and orally, the science behind the biology and management of domestically farmed animals. Their communications provide new insights into animal production, and are explained in a manner fitting with the audience. Our students' ability to communicate is measured by their effectiveness in presenting research posters and presentations, their analysis of the literature in papers and presentations in class and during their senior capstone course.

### Four-Year Plan

#### Freshman

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AN SCI/DY SCI 101</td>
<td>4</td>
<td>CHEM 104</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 103</td>
<td>4</td>
<td>Social Science</td>
<td>3-4</td>
</tr>
<tr>
<td>MATH 114 or 112(^1)</td>
<td>3-5</td>
<td>AN SCI Elective</td>
<td>1-3</td>
</tr>
<tr>
<td>COMM-A</td>
<td>3</td>
<td>MATH 113 (or Elective)</td>
<td>3</td>
</tr>
<tr>
<td>First-Year Seminar</td>
<td>1</td>
<td>Humanities</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>15-17</td>
<td></td>
<td>15-18</td>
</tr>
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</table>

#### Sophomore

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZOOLOGY/BIOLOGY/BOTANY 151</td>
<td>3</td>
<td>Emphasis Course</td>
<td>3</td>
</tr>
<tr>
<td>Emphasis Course(^2)</td>
<td>3</td>
<td>Emphasis or Depth Course</td>
<td>3</td>
</tr>
<tr>
<td>Ethnic/International Studies</td>
<td>3</td>
<td>AN SCI/FOOD SCI 305</td>
<td>4</td>
</tr>
<tr>
<td>Emphasis or Depth Course</td>
<td>3-4</td>
<td>ZOOLOGY/BIOLOGY/BOTANY 152</td>
<td>5</td>
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<tr>
<td></td>
<td>14-15</td>
<td></td>
<td>15</td>
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</table>

#### Junior

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emphasis Course</td>
<td>3</td>
<td>AN SCI/DY SCI/ NUTR SCI 311</td>
<td>3</td>
</tr>
<tr>
<td>STAT 371</td>
<td>3</td>
<td>An Sci Depth(^3)</td>
<td>3</td>
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<tr>
<td>AN SCI/DY SCI 434</td>
<td>3</td>
<td>AN SCI/DY SCI 320</td>
<td>3</td>
</tr>
<tr>
<td>GENETICS 466</td>
<td>3</td>
<td>Emphasis Course</td>
<td>3</td>
</tr>
<tr>
<td>Emphasis Course</td>
<td>3</td>
<td>Select one of the following</td>
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<tr>
<td></td>
<td></td>
<td>AN SCI/DY SCI 361</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&amp; AN SCI/DY SCI 362</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>AN SCI/DY SCI 361</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>&amp; AN SCI/DY SCI 363</td>
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<td>15</td>
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#### Senior

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>AN SCI 435</td>
<td>2</td>
<td>An Sci Depth</td>
<td>6</td>
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<tr>
<td>An Sci Depth</td>
<td>3</td>
<td>Independent Study(^4)</td>
<td>1-3</td>
</tr>
<tr>
<td>Emphasis Course</td>
<td>4</td>
<td>Electives</td>
<td>6</td>
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<tr>
<td>Humanities</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>COMM-B</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td></td>
<td>13-15</td>
</tr>
</tbody>
</table>

Total Credits 118-126
1 If placed into MATH 112 Algebra, you must defer CHEM 103 General Chemistry I until Spring semester.

2 Choose Science or Business Emphasis; see Requirements tab for details.

3 12 credits required; see Requirements tab for options.

4 Select from AN SCI 289 Honors Independent Study, AN SCI 699 Special Problems, AN SCI 681 Senior Honor Thesis, AN SCI 682 Senior Honors Thesis, AN SCI 299 Independent Study, or AN SCI 399 Coordinative Internship/Cooperative Education.

**ADVISING AND CAREERS**

All students receive individualized advising from their academic advisors. The department has several livestock and meat-related scholarships. Internships and research experience are encouraged. Numerous graduates have completed double majors with Life Science Communication, Poultry Science, Genetics, and departments outside of CALS such as Spanish, according to the interests and aspirations of the student. Students are assigned a faculty advisor upon declaration of the major. Interested students should contact Kathy Monson (kamonson@wisc.edu) (608-263-5225) with questions.

Career opportunities exist in the meat, artificial insemination, feed, agribusiness, agri-marketing and biotechnology industries. Occasionally, students have found positions within zoos. Many students pursue graduate education in veterinary medicine, medicine, animal science, or other programs.

**PEOPLE**

**PROFESSORS**
Albrecht, Claus, Cook, Crenshaw (chair), Gianola, Khatib, Kirkpatrick, Parrish, Reed, Richards, Rosa, Schaefer, Thomas

**ASSOCIATE PROFESSOR**
Sindelar (Extension)

**ASSISTANT PROFESSOR**
Shanmuganayagam

**INSTRUCTIONAL STAFF**
Barry, Kean, Monson, O'Rourke, Russell, Sandberg