ZOOLOGY, B.S.

The zoology major is a gateway to the diverse areas of modern biology. The major can be tailored to prepare students for advanced study and careers in many different areas: health professions and public health; law; life sciences research in university, government, and industrial settings; education including museum, nature center, secondary school, and college teaching; biotechnology; and environmental studies.

Specialized preparation is offered in ecology, systematics, limnology, morphology, molecular biology, cellular biology, developmental biology, genetics, neurobiology, physiology, evolution, and behavior. Several possible areas, emphasizing different interests, are outlined in the requirements tab. They include ecology, evolution, and behavior; anatomy, physiology, and organismal biology; and cellular, molecular, and developmental biology. The department encourages undergraduate participation in research and offers summer research scholarships to outstanding students.

GOALS OF THE ZOOLOGY MAJOR

The zoology major emphasizes critical thinking and conceptual skills that come from an understanding of how scientific information is obtained and evaluated, and of how this information can be applied to societal issues. The major provides a solid foundation in genetic, cellular, physiological, ecological, and evolutionary principles, and in the related disciplines of chemistry, physics, and mathematics. As a result, the major fosters an understanding of biological complexity including the interrelationships among humans and natural systems.

The unique characteristics of the zoology major include:

- broad-based, yet integrated training in wide-ranging areas of biology;
- solid foundation of basic principles and processes in biology;
- flexibility and advising needed to allow students to tailor the major to their specific goals;
- wide range of opportunities for undergraduate involvement in independent research and senior thesis.

HOW TO GET IN

All students who are interested in pursuing the zoology major must schedule an appointment with the Zoology Major advisor (https://integrativebiology.wisc.edu/undergraduate-programs/zoology-major/zoology-undergraduate-major-advising/). No major declaration forms are required to declare zoology major.

REQUIREMENTS

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/#requirementsforundergraduatestudytext) section of the *Guide*.

General Education	• Breadth—Humanities/Literature/Arts: 6 credits • Breadth—Natural Science: 4 to 6 credits, consisting of one 4- or 5-credit course with a laboratory component; or two courses providing a total of 6 credits • Breadth—Social Studies: 3 credits • Communication Part A & Part B * • Ethnic Studies * • Quantitative Reasoning Part A & Part B * * The mortarboard symbol appears before the title of any course that fulfills one of the Communication Part A or Part B, Ethnic Studies, or Quantitative Reasoning Part A or Part B requirements.

COLLEGE OF LETTERS & SCIENCE DEGREE REQUIREMENTS: BACHELOR OF SCIENCE (B.S.)

Students pursuing a Bachelor of Science degree in the College of Letters & Science must complete all of the requirements below. The College of Letters & Science allows this major to be paired with either the Bachelor of Arts or the Bachelor of Science degree requirements.

BACHELOR OF SCIENCE DEGREE REQUIREMENTS

Mathematics	Complete two courses of 3+ credits at the Intermediate or Advanced level in MATH, COMP SCI, or STAT subjects. A maximum of one course in each of COMP SCI and STAT subjects counts toward this requirement.
Foreign Language	Complete the third unit of a foreign language.
L&S Breadth	Complete: • 12 credits of Humanities, which must include at least 6 credits of Literature; and • 12 credits of Social Science; and • 12 credits of Natural Science, which must include 6 credits of Biological Science and 6 credits of Physical Science.
Liberal Arts and Science Coursework	Complete at least 108 credits.
Depth of Intermediate/Advanced Coursework	Complete at least 60 credits at the Intermediate or Advanced level.
Major	Declare and complete at least one major.
Total Credits	Complete at least 120 credits.
UW-Madison Experience	Complete both: • 30 credits in residence, overall, and • 30 credits in residence after the 86th credit.
Quality of Work	• 2.000 in all coursework at UW–Madison • 2.000 in Intermediate/Advanced level coursework at UW–Madison

NON–L&S STUDENTS PURSUING AN L&S MAJOR

Non–L&S students who have permission from their school/college to pursue an additional major within L&S only need to fulfill the major requirements. They do not need to complete the L&S Degree Requirements above.

REQUIREMENTS FOR THE MAJOR

MATH, CHEMISTRY & PHYSICS

Code	Title	Credits
Math—complete one:		**5-10**
MATH 112 & MATH 113	Algebra and Trigonometry	
MATH 114	Algebra and Trigonometry	
MATH 171 & MATH 217	Calculus with Algebra and Trigonometry I and Calculus with Algebra and Trigonometry II	
Chemistry—complete one:		**5-9**
CHEM 103 & CHEM 104	General Chemistry I and General Chemistry II	
CHEM 109	Advanced General Chemistry	
Physics—complete one:		**8-10**
PHYSICS 103 & PHYSICS 104	General Physics and General Physics	
PHYSICS 201 & PHYSICS 202	General Physics and General Physics	
PHYSICS 207 & PHYSICS 208	General Physics and General Physics	
Total Credits		**18-29**

30 CREDITS IN BIOLOGY AND ZOOLOGY COURSEWORK

Introductory Biology

Code	Title	Credits
Option 1: Introductory Biology		**10**
ZOOLOGY/ BIOLOGY/ BOTANY 151 & ZOOLOGY/ BIOLOGY/ BOTANY 152	Introductory Biology and Introductory Biology	
Option 2: BIOCORE—complete both:		**10**
BIOCORE 381 & BIOCORE 382	Evolution, Ecology, and Genetics and Evolution, Ecology, and Genetics Laboratory	
BIOCORE 383 & BIOCORE 384	Cellular Biology and Cellular Biology Laboratory	
Option 3: Animal Biology [1]		**5**
ZOOLOGY/ BIOLOGY 101 & ZOOLOGY/ BIOLOGY 102	Animal Biology and Animal Biology Laboratory	
Total Credits		**5-10**

[1] BOTANY/BIOLOGY 130 is recommended, but not required for students pursuing Option 3 (Animal Biology).

Electives

Code	Title	Credits
ZOOLOGY 299	Directed Studies in Zoology	
ZOOLOGY 300	Invertebrate Biology and Evolution	
ZOOLOGY 301	Invertebrate Biology and Evolution Lab	
ZOOLOGY/ ENTOM 302	Introduction to Entomology	
MICROBIO 303	Biology of Microorganisms	
ZOOLOGY 303	Aquatic Invertebrate Biology	
MICROBIO 304	Biology of Microorganisms Laboratory	
ZOOLOGY 304	Marine Biology	
F&W ECOL 306	Terrestrial Vertebrates: Life History and Ecology	
BMOLCHEM 314	Introduction to Human Biochemistry	
ZOOLOGY/ ENVIR ST 315	Limnology-Conservation of Aquatic Resources	
ZOOLOGY 316	Laboratory for Limnology-Conservation of Aquatic Resources	
ANAT&PHY 335	Physiology [1]	
ZOOLOGY/ F&W ECOL 335	Human/Animal Relationships: Biological and Philosophical Issues	
ANAT&PHY 338	Human Anatomy Laboratory	
M M & I 341	Immunology	
ZOOLOGY/ ENTOM/M M & I/ PATH-BIO 350	Parasitology	
ZOOLOGY/ ENVIR ST/ F&W ECOL 360	Extinction of Species	
ENVIR ST/ LAND ARC 361	Wetlands Ecology	
ZOOLOGY/ ENTOM 371	Medical Entomology	
ENVIR ST 375	Field Ecology Workshop	
ZOOLOGY 400	Topics in Biology	
ZOOLOGY 405	Introduction to Museum Studies in the Natural Sciences	
ZOOLOGY/ ANTHRO/ BOTANY 410	Evolutionary Biology	
ZOOLOGY 425	Behavioral Ecology	
ZOOLOGY 430	Comparative Anatomy of Vertebrates	
PSYCH 449	Animal Behavior	
ENTOM 450	Basic and Applied Insect Ecology	
PSYCH 450	Primates and Us: Insights into Human Biology and Behavior	
ZOOLOGY/ BOTANY 450	Midwestern Ecological Issues: A Case Study Approach	
PSYCH 454	Behavioral Neuroscience	
PSYCH 455	Laboratory in Behavioral Neuroscience	
ANTHRO 458	Primate Behavioral Ecology	

ZOOLOGY/ BOTANY/ F&W ECOL 460	General Ecology
GENETICS 466	Principles of Genetics
ZOOLOGY 470	Introduction to Animal Development
ZOOLOGY/ BOTANY/ ENTOM 473	Plant-Insect Interactions
PATH-BIO/ HORT 500	Molecular Biology Techniques
ZOOLOGY 500	Undergraduate Neurobiology Seminar
BIOCHEM 501	Introduction to Biochemistry
BMOLCHEM 503	Human Biochemistry
BMOLCHEM 504	Human Biochemistry Laboratory
ZOOLOGY 504	Modeling Animal Landscapes
BIOCHEM 507	General Biochemistry I
ZOOLOGY/ ENVIR ST 510	Ecology of Fishes
ZOOLOGY/ ENVIR ST 511	Ecology of Fishes Lab
ZOOLOGY/ AN SCI/ F&W ECOL 520	Ornithology
ZOOLOGY/ AN SCI/ F&W ECOL 521	Birds of Southern Wisconsin
ZOOLOGY/ PSYCH 523	Neurobiology
ZOOLOGY 525	Tropical Herpetology
M M & I/PATH-BIO 528	Immunology
ZOOLOGY/ ENTOM 540	Theoretical Ecology
ZOOLOGY/ GEOSCI 541	Paleobiology
ZOOLOGY/ GEOSCI 542	Invertebrate Paleontology
GENETICS 545	Genetics Laboratory
F&W ECOL/ SURG SCI 548	Diseases of Wildlife
ZOOLOGY 555	Laboratory in Developmental Biology
ZOOLOGY 562	
ZOOLOGY/ F&W ECOL/ LAND ARC 565	Principles of Landscape Ecology
GENETICS 566	Advanced Genetics
ZOOLOGY 570	Cell Biology
ZOOLOGY 603	Endocrinology
ZOOLOGY 604	Computer-based Gene and Disease/ Disorder Research Lab
F&W ECOL/ ENTOM/PL PATH/ SOIL SCI 606	Colloquium in Environmental Toxicology
ZOOLOGY 611	Comparative and Evolutionary Physiology
ZOOLOGY 612	Comparative Physiology Laboratory
ZOOLOGY/ NEURODPT/ NTP 616	Lab Course in Neurobiology and Behavior
ZOOLOGY/ ANTHRO/NTP/ PSYCH 619	Biology of Mind
ZOOLOGY/ NTP 620	Neuroethology Seminar
ZOOLOGY/ ENTOM/ GENETICS 624	Molecular Ecology
ZOOLOGY 625	Development of the Nervous System
ZOOLOGY/ BIOCHEM/ PHMCOL-M 630	Cellular Signal Transduction Mechanisms
ZOOLOGY/ BOTANY/ ENVIR ST/ F&W ECOL 651	Conservation Biology
ZOOLOGY 655	Modeling Neurodevelopmental Disease
ZOOLOGY/ F&W ECOL 660	Climate Change Ecology
ZOOLOGY/ BOTANY/ F&W ECOL 672	Historical Ecology
ZOOLOGY/ NEURODPT/ PSYCH 674	Behavioral Neuroendocrinology Seminar
ZOOLOGY 677	Internship in Ecology
ZOOLOGY 681 & ZOOLOGY 682	Senior Honors Thesis and Senior Honors Thesis
ZOOLOGY 691 & ZOOLOGY 692	Senior Thesis and Senior Thesis
ZOOLOGY 698	Directed Study
ZOOLOGY 699	Directed Studies in Zoology
Total Credits	**20-25**

A maximum of 6 credits of approved non-ZOOLOGY subject courses count toward the 30 credits required for the major. Students can take ZOOLOGY/BIOLOGY 101 Animal Biology and ZOOLOGY/ BIOLOGY 102 Animal Biology Laboratory for the Introductory Biology requirement is recommended for students who complete this sequence.

[1] Only 3 credits of ANAT&PHY 335 Physiology count toward the 6 credits of approved non-ZOOLOGY subject courses.

RESIDENCE AND QUALITY OF WORK

- 2.000 GPA in all ZOOLOGY and major courses
- 2.000 GPA on 15 Upper Level major credits, taken in Residence [1]
- 15 credits in ZOOLOGY, or courses that count for the major, taken on the UW–Madison campus

[1] ZOOLOGY 299–699, intermediate/advanced BIOCORE, and courses that count toward the major that have an intermediate/advanced designation are considered Upper Level in the major.

HONORS IN THE ZOOLOGY MAJOR

To earn Honors in the Major in Zoology, students must satisfy both the requirements for the major (above) and the following additional requirements:

- Earn a 3.300 University GPA
- Earn a 3.300 GPA in all courses that count toward the major
- Complete 12 credits, taken for Honors, with individual grades of B or better. Select 6 credits from ZOOLOGY 300-680 or approved non-ZOOLOGY subject courses (above).
- Complete ZOOLOGY 681 and ZOOLOGY 682, for a total of 6 credits.[1]

[1] A written thesis proposal must be approved by the thesis mentor and a department advisor. While most theses are completed during the fall and spring of a student's senior year, other combinations of terms are possible. More information about the proposal process, timing, and grading of a thesis can be found on the Department of Integrative Biology website.

UNIVERSITY DEGREE REQUIREMENTS

Total Degree	To receive a bachelor's degree from UW–Madison, students must earn a minimum of 120 degree credits. The requirements for some programs may exceed 120 degree credits. Students should consult with their college or department advisor for information on specific credit requirements.
Residency	Degree candidates are required to earn a minimum of 30 credits in residence at UW–Madison. "In residence" means on the UW–Madison campus with an undergraduate degree classification. "In residence" credit also includes UW–Madison courses offered in distance or online formats and credits earned in UW–Madison Study Abroad/Study Away programs.
Quality of Work	Undergraduate students must maintain the minimum grade point average specified by the school, college, or academic program to remain in good academic standing. Students whose academic performance drops below these minimum thresholds will be placed on academic probation.

LEARNING OUTCOMES

1. Connect and describe the concepts that make up the structure and function of all living things through the principles of genetics, cellular biology, and physiology.
2. Demonstrate an understanding of the diversity of life through the principles of evolution.
3. Make connections between organisms, their habitats, and systems through the principles of ecology.
4. Make connections between the biological sciences to humans and ecological systems and appreciate the complexity of these systems.
5. Identify, think through, and solve a problem using quantitative reasoning and critical thinking skills.
6. Develop an ability to plan and carry out scientific experiments by obtaining and evaluating scientific information and effectively communicating information through oral and written presentations.
7. Understand current issues in biology and apply scientific knowledge to societal issues.
8. Make connections between self and natural world, and personal responsibility with social issues.
9. Develop a sense of competence in the field of study through research experiences and written and oral communication of findings.

FOUR-YEAR PLAN

SAMPLE FOUR-YEAR PLAN

This Sample Four-Year Plan is a tool to assist students and their advisor(s). Students should use it—along with their DARS report, the Degree Planner, and Course Search & Enroll tools—to make their own four-year plan based on their placement scores, credit for transferred courses and approved examinations, and individual interests. As students become involved in athletics, honors, research, student organizations, study abroad, volunteer experiences, and/or work, they might adjust the order of their courses to accommodate these experiences. Students will likely revise their own four-year plan several times during college.

Freshman

Fall	Credits	Spring	Credits
CHEM 103 or 109	4-5	CHEM 104	5
MATH 112, 114, or 171	3-5	MATH 113 or 217	3-5
Communication A[1]	3	L&S Breadth	3
Foreign Language (if required)	3-4	Social Science Breadth	3
	14		**14**

Sophomore

Fall	Credits	Spring	Credits
ZOOLOGY/BIOLOGY/ BOTANY 151[1]	5	ZOOLOGY/BIOLOGY/ BOTANY 152 (Satisfies Communication B)[1]	5
Ethnic Studies	3	L&S Breadth	3
INTER-LS 210	1	Social Science Breadth	3
Social Science Breadth	3	Elective	3
Elective	4		
	16		**14**

Junior

Fall	Credits	Spring	Credits
PHYSICS 103, 201, or 207	4-5	PHYSICS 104, 202, or 208	4-5
I/A COMP SCI, MATH, or STAT (if required for the BS)	3-5	I/A COMP SCI, MATH, or STAT (required for the BS)	3-5
I/A ZOOLOGY	3-6	I/A ZOOLOGY	4
Elective	3	L&S Breadth	3
	16		**14**

Senior

Fall	Credits	Spring	Credits
I/A ZOOLOGY	3-4	I/A ZOOLOGY	3-4
Elective	3-4	I/A ZOOLOGY	3-4

L&S Breadth	3 Elective	6
Elective	3-6 Social Science Breadth	3
	17	**15**

Total Credits 120

[1] Students can take ZOOLOGY/BIOLOGY 101 Animal Biology and ZOOLOGY/BIOLOGY 102 Animal Biology Laboratory for the Introductory Biology requirement is recommended for students who complete this sequence.

Student may also satisfy Introductory Biology with BIOCORE. Consult the advisor for the program regarding this option.

ADVISING AND CAREERS

ADVISING

Students are encouraged to consult with a department advisor to construct individual programs appropriate to their own needs. Please use Starfish or call 608-262-2742 to make an appointment with the zoology advisor. iBio Starfish (https://wisc.starfishsolutions.com/starfish-ops/dl/instructor/serviceCatalog.html?bookmark=connection/78583/schedule)

DIRECTED STUDY

The zoology major is an excellent scaffold for students interested in an undergraduate research experience. A maximum of 10 credits of Directed Studies (ZOOLOGY 299, ZOOLOGY 698, ZOOLOGY 699), Senior Thesis (ZOOLOGY 691, ZOOLOGY 692), or Senior Honors Thesis (ZOOLOGY 681, ZOOLOGY 682) will count toward the 30 credits required for the major.

The Department of Integrative Biology offers both ZOOLOGY 299 Directed Studies in Zoology and ZOOLOGY 699 Directed Studies in Zoology. ZOOLOGY 299 is recommended for students before they have completed their introductory biology course sequence, and ZOOLOGY 699 is recommended for students who have completed their introductory biology course sequence. Directed Studies in Zoology are graded on an A to F scale. Students cannot take Directed Studies on a pass/fail basis.

Directed Studies allows students to gain experience in a wide range of research areas in biology and to learn research techniques that are not easily taught in the classroom. Such experiences allow students to make more informed decisions about their future goals and careers.

Before students can enroll in ZOOLOGY 299 or ZOOLOGY 699, they must set up an appointment with a professor/mentor of their choice, and work with the professor/mentor to:

1. Decide the specific number of credits, and
2. Plan the work required to earn those credits.

Such plans can involve reviewing relevant literature in the area, developing a proposal for independent research, and/or conducting an experiment in the mentor's study area.

Students interested in doing in-depth research as undergraduates in an area of interest can elect to do a Senior Thesis or Senior Honors Thesis (see below). Students should contact a department advisor at the beginning of their junior year to explore possible research areas.

SENIOR THESIS

Students interested in making a longer-term commitment to a research project may consider undertaking a Senior Thesis. Students should contact a department advisor during their junior year to explore possible research areas in zoology.

Zoology Senior Thesis Requirements:

1. Approval of a department advisor, and
2. Completion of ZOOLOGY 691 and ZOOLOGY 692, a two-semester thesis research sequence, during the senior year (6 credits).

It is recommended that candidates for the Senior Thesis take ZOOLOGY 699 during second semester junior year to prepare for the thesis.

CAREERS

The Department of Integrative Biology encourages our majors to begin working on their career exploration and preparation soon after arriving on campus. We partner with SuccessWorks at the College of Letters & Science (https://careers.ls.wisc.edu/). L&S graduates are in high demand by employers and graduate programs. It is important to us that our students are career ready at the time of graduation, and we are committed to your success.

L&S CAREER RESOURCES

SuccessWorks at the College of Letters & Science helps students leverage the academic skills learned in their major, certificates, and liberal arts degree; explore and try out different career paths; participate in internships; prepare for the job search and/or graduate school applications; and network with professionals in the field (alumni and employers). In short, SuccessWorks helps students in the College of Letters & Science discover themselves, find opportunities, and develop the skills they need for success after graduation.

SuccessWorks can also assist students in career advising, résumé and cover letter writing, networking opportunities, and interview skills, as well as course offerings for undergraduates to begin their career exploration early in their undergraduate career.

Students should set up their profiles in Handshake (https://careers.ls.wisc.edu/handshake/) to take care of everything they need to explore career events, manage their campus interviews, and **apply to jobs and internships from 200,000+ employers around the country**.

- SuccessWorks (https://careers.ls.wisc.edu/)
- Set up a career advising appointment (https://careers.ls.wisc.edu/make-an-appointment/)
- INTER-LS 210 L&S Career Development: Taking Initiative (1 credit, targeted to first- and second-year students)—for more information, see Inter-LS 210: Career Development, Taking Initiative (https://careers.ls.wisc.edu/inter-ls-210-career-development-taking-initiative/)
- INTER-LS 215 Communicating About Careers (3 credits, fulfills Com B General Education Requirement)
- Handshake (https://careers.ls.wisc.edu/handshake/)
- Learn how we're transforming career preparation: L&S Career Initiative (http://ls.wisc.edu/lsci/)

PEOPLE

Professors Riters (chair, lvriters@wisc.edu), Bement, Blair, Damschen, Gammie, Halloran, Hardin, Ives, Lee, Newmark, Orrock, Stanley, Turner, and Vander Zanden

Associate Professors Amann, Grinblat, and Jensen

Assistant Professors Drerup, Dugan, Ehrlich, Ragsdale, Sharma, Wang, Weber and Wilkinson