NEUROBIOLOGY, B.A.

Neuroscience is the scientific study of the central (brain and spinal cord) and peripheral (nerves in body) nervous system. The neurobiology major at UW–Madison will provide a rigorous education in neuroscience principles that will prepare students for health-related careers (physician, physician assistant, veterinarian, dentist, neuroimaging technician, speech-language pathologist, neuropsychologist, drug rehabilitation counselor, physical therapists), academic careers (college and university faculty, research scientists, lab technician, K-12 teachers), and careers in pharmaceutical and biotech industries, venture capital and scientific consulting firms, medical and scientific journals, intellectual property law, neuroscience-related nonprofit organizations and foundations, and government agencies. UW–Madison is one of the leading universities in the world with more than 90 faculty engaged in neuroscience research and undergraduates will have access to this research faculty in formal classroom environments and through undergraduate research opportunities. Please see the Neurobiology Major (http://www.neuromajor.wisc.edu) website for more information.

ABOUT THE CURRICULUM

The curriculum is designed to give students a solid foundation in basic biology, chemistry, physics, and mathematics before going on to study neuroscience at the molecular, cellular, systems, and cognitive levels. Students with interests in non-neuroscience majors are welcome and encouraged to enroll in neuroscience courses. For example, students may be attracted to the diversity and flexibility of courses offered within the biology major in the College of Agricultural and Life Sciences and still take several neuroscience courses that satisfy requirements in the biology major. Students can also perform independent research in neuroscience laboratories on campus. Students in other majors, such as biochemistry, psychology, genetics, animal sciences, communication sciences and disorders, engineering, and computer science, can enroll in neuroscience courses that uniquely complement courses within their major. The Neurobiology Major Program Committee is committed to increasing opportunities for all students with interests in neuroscience and helping students accomplish their academic goals at UW–Madison. This new major is tailored to attract students from a diverse array of backgrounds. Please see the Neurobiology Major website (http://www.neuromajor.wisc.edu) for more information.

HOW TO GET IN

The advisors for the Neurobiology Major (https://neuromajor.wisc.edu) are committed to providing students with first-rate guidance through the major to graduation and beyond. Most students are ready to declare a major by the end of the 3rd or 4th semester. If you are interested in declaring the Neurobiology Major, you must first make an appointment to meet with an advisor.

See our website (https://neuromajor.wisc.edu/advising) to schedule an appointment.

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/#requirementsforundergraduatesystemtext) 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 BREADTH AND DEGREE REQUIREMENTS: BACHELOR OF ARTS (B.A.)

Students pursuing a bachelor of arts 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 a bachelor of arts or a bachelor of science curriculum. View a comparison of the degree requirements here. (https://pubs.wisc.edu/home/archives/ug15/images/babs2009.pdf)

BACHELOR OF ARTS DEGREE REQUIREMENTS

Mathematics

Fulfilled with completion of University General Education requirements Quantitative Reasoning a (QR A) and Quantitative Reasoning b (QR B) coursework. Please note that some majors may require students to complete additional math coursework beyond the B.A. mathematics requirement.

Foreign Language

• Complete the fourth unit of a foreign language; OR
• Complete the third unit of a foreign language and the second unit of an additional foreign language

Note: A unit is one year of high school work or one semester/term of college work.
L&S Breadth

- Humanities, 12 credits: 6 of the 12 credits must be in literature
- Social Sciences, 12 credits
- Natural Sciences, 12 credits: must include one 3+ credit course in the biological sciences; must include one 3+ credit course in the physical sciences

Liberal Arts and Science Coursework

- 108 credits
- Depth of Intermediate/Advanced work: 60 intermediate or advanced credits

Major

- Declare and complete at least one (1) major

Total Credits

- 120 credits

UW-Madison Experience

- 30 credits in residence, overall
- 30 credits in residence after the 86th credit

Minimum GPAs

- 2.000 in all coursework at UW–Madison
- 2.000 in intermediate/advanced 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 and do not need to complete the L&S breadth and degree requirements above. Please note that the following special degree programs are not considered majors so are not available to non–L&S degree-seeking candidates:

- Applied Mathematics, Engineering and Physics (Bachelor of Science–Applied Mathematics, Engineering and Physics)
- Journalism (Bachelor of Arts–Journalism; Bachelor of Science–Journalism)
- Music (Bachelor of Music)
- Social Work (Bachelor of Social Work)

REQUIREMENTS FOR THE MAJOR

MATH, STATISTICS, CHEMISTRY & PHYSICS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>Mathematics (complete one):</td>
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<tr>
<td>MATH 211</td>
<td>Calculus</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 and Analytic Geometry I</td>
<td></td>
</tr>
<tr>
<td>MATH 275</td>
<td>Topics in Calculus I</td>
<td></td>
</tr>
<tr>
<td>Statistics (complete one):</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>STAT 371</td>
<td>Introductory Applied Statistics for the Life Sciences</td>
<td></td>
</tr>
<tr>
<td>STAT/BM 541</td>
<td>Introduction to Biostatistics</td>
<td></td>
</tr>
<tr>
<td>BOTANY 575</td>
<td>Special Topics (Intro to Modern Statistical Methods for Biologists)</td>
<td></td>
</tr>
<tr>
<td>General Chemistry (complete one):</td>
<td></td>
<td>5-9</td>
</tr>
<tr>
<td>CHEM 103</td>
<td>General Chemistry I</td>
<td></td>
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<tr>
<td>CHEM 109</td>
<td>Advanced General Chemistry</td>
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<tr>
<td>&amp; CHEM 104</td>
<td>and General Chemistry II</td>
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<tr>
<td>CHEM 115</td>
<td>Chemical Principles I</td>
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</tr>
<tr>
<td>CHEM 116</td>
<td>and Chemical Principles II</td>
<td></td>
</tr>
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</table>

Organic Chemistry (complete one): 3-6

| CHEM 341   | Elementary Organic Chemistry              |         |
| CHEM 343   | Introductory Organic Chemistry            |         |
| & CHEM 345 | and Intermediate Organic Chemistry        |         |

Physics: 8-10

| PHYSICS 103 | General Physics                           |         |
| PHYSICS 201 | General Physics                           |         |
| PHYSICS 207 | General Physics                           |         |
| PHYSICS 247 | A Modern Introduction to Physics          |         |

| PHYSICS II |                                        |         |
| PHYSICS 104 | General Physics                         |         |
| PHYSICS 202 | General Physics                         |         |
| PHYSICS 208 | General Physics                         |         |
| PHYSICS 248 | A Modern Introduction to Physics        |         |

Total Credits 24-33

1 Students may substitute E M A 201, plus either E M A 202 or M E 240 for the first course in Physics.

30 CREDITS OF BIOLOGY AND NEUROBIOLOGY

Will be calculated from General Biology, Neurobiology, Lab/Research Experience and Additional Elective (if required) sections.

General Biology

<table>
<thead>
<tr>
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<th>Credits</th>
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<tbody>
<tr>
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<tr>
<td>Introductory Biology</td>
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<td></td>
</tr>
<tr>
<td>ZOOLOGY/ BIOLOGY/ BOTANY 151</td>
<td>Introductory Biology</td>
<td></td>
</tr>
<tr>
<td>ZOOLOGY/ BIOLOGY/ BOTANY 152</td>
<td>Introductory Biology</td>
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Biology Core Curriculum 16-18

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>BIOCORE 381</td>
<td>Evolution, Ecology, and Genetics</td>
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<tr>
<td>BIOCORE 383</td>
<td>Cellular Biology</td>
<td></td>
</tr>
<tr>
<td>BIOCORE 485</td>
<td>Principles of Physiology</td>
<td></td>
</tr>
<tr>
<td>BIOCORE 587</td>
<td>Biological Interactions</td>
<td></td>
</tr>
<tr>
<td>Plus two from:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOCORE 382</td>
<td>Evolution, Ecology, and Genetics Laboratory</td>
<td></td>
</tr>
<tr>
<td>BIOCORE 384</td>
<td>Cellular Biology Laboratory</td>
<td></td>
</tr>
<tr>
<td>BIOCORE 486</td>
<td>Principles of Physiology Laboratory</td>
<td></td>
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</tbody>
</table>

Animal Biology 10

<table>
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<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td>ZOOLOGY/ BIOLOGY 101</td>
<td>Animal Biology</td>
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<td>ZOOLOGY/ BIOLOGY 102</td>
<td>Animal Biology Laboratory</td>
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<tr>
<td>BOTANY/ BIOLOGY 130</td>
<td>General Botany</td>
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### Neurobiology

**Required Neurobiology Courses**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ZOOLOGY/PSYCH 523</td>
<td>Neurobiology</td>
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<tr>
<td>PSYCH 454</td>
<td>Behavioral Neuroscience</td>
<td>3</td>
</tr>
<tr>
<td>ZOOLOGY 500</td>
<td>Undergraduate Neurobiology Seminar</td>
<td>1</td>
</tr>
</tbody>
</table>

**Distributed Neuroscience Coursework—choose three courses**

- ANAT&PHY 335 Physiology^1
- ANAT&PHY 435 Fundamentals of Human Physiology^1
- BIOCHEM 501 Introduction to Biochemistry^1
- BIOCHEM 508 General Biochemistry II^1
- BIOCHEM/PHMCOL-M/ZOOLOGY 630 Cellular Signal Transduction Mechanisms^1
- BIOCHEM/NUTR SCI 645 Molecular Control of Metabolism and Metabolic Disease^1
- B M E/CBE 520 Stem Cell Bioengineering^1
- CS&D 210 Neural Basis of Communication
- CS&D 503 Neural Mechanisms of Speech, Hearing and Language
- ED PSYCH 326 Mind, Brain and Education
- GENETICS 520 Neurogenetics
- KINES 531 Neural Control of Movement
- NTP/NEURODPT 610 Neuroscience
- NTP/NEURODPT/PSYCH 611 Systems Neuroscience
- NTP/ZOOLOGY 616 Lab Course in Neurobiology and Behavior
- NTP/NEURODPT 629 Molecular and Cellular Mechanisms of Memory
- NTP/NEURODPT 630 Neuronal Mechanisms for Sensation and Memory in Cerebral Cortex
- NTP/MED PHYS 651 Methods for Neuroimaging Research
- NTP 670 Stem Cells and the Central Nervous System
- NTP 675 Special Topics (Functional Brain Imaging of Cognitive Disorders)
- NTP 675 Special Topics (Molecular Mechanisms of Brain Damage)
- NTP 675 Special Topics (Neuroendocrinology)
- NTP 675 Special Topics (Reproductive Neuroendocrinology)
- NTP 675 Special Topics (Brain Mapping in Health and Disease: Applications)
- NTP 677 Basic Sleep Mechanisms and Sleep Disorders: from Neurobiology to Sleep Medicine
- PHM SCI 401 Survey of Pharmacology
- PHM SCI/PHMCOL-M 521 Pharmacology I
- NEURODPT 533 Molecular Physiology
- PSYCH 406 Psychology of Perception
- PSYCH 414 Cognitive Psychology
- PSYCH 505 Depth Topic in Biological Science (Cognitive Neuroscience: Bridging Mind and Brain)
- PSYCH 513 Hormones, Brain, and Behavior
- PSYCH 601 Current Topics in Psychology (Epigenetics and the Brain)
- PSYCH 601 Current Topics in Psychology (Neuropharmacology)
- PSYCH 601 Current Topics in Psychology (Neural Basis of Cognitive Control)
- PSYCH 601 Current Topics in Psychology (Neuroeconomics)
- PSYCH 606 Hormones and Behavior
- ZOOLOGY 470 Introduction to Animal Development^1
- ZOOLOGY 555 Laboratory in Developmental Biology
- ZOOLOGY 603 Endocrinology
- ZOOLOGY 604 Computer-based Gene and Disease/Disorder Research Lab
- ZOOLOGY 611 Comparative and Evolutionary Physiology
- ZOOLOGY/ANTHRO/NEURODPT PSYCH 674 Behavioral Neuroendocrinology Seminar
- NTP 677 Special Topics (Neuroendocrinology)
- NTP 677 Special Topics (Reproductive Neuroendocrinology)
- NTP 677 Special Topics (Brain Mapping in Health and Disease: Applications)
- NTP 677 Basic Sleep Mechanisms and Sleep Disorders: from Neurobiology to Sleep Medicine
- PHM SCI 401 Survey of Pharmacology
- PHM SCI/PHMCOL-M 521 Pharmacology I
- NEURODPT 533 Molecular Physiology
- PSYCH 406 Psychology of Perception
- PSYCH 414 Cognitive Psychology
- PSYCH 505 Depth Topic in Biological Science (Cognitive Neuroscience: Bridging Mind and Brain)
- PSYCH 513 Hormones, Brain, and Behavior
- PSYCH 601 Current Topics in Psychology (Epigenetics and the Brain)
- PSYCH 601 Current Topics in Psychology (Neuropharmacology)
- PSYCH 601 Current Topics in Psychology (Neural Basis of Cognitive Control)
- PSYCH 601 Current Topics in Psychology (Neuroeconomics)
- PSYCH 606 Hormones and Behavior
- ZOOLOGY 470 Introduction to Animal Development^1
- ZOOLOGY 555 Laboratory in Developmental Biology
- ZOOLOGY 603 Endocrinology
- ZOOLOGY 604 Computer-based Gene and Disease/Disorder Research Lab
- ZOOLOGY 611 Comparative and Evolutionary Physiology
- ZOOLOGY/ANTHRO/NEURODPT PSYCH 674 Behavioral Neuroendocrinology Seminar

^1 Students may apply only one footnoted course toward the elective requirement.

**Lab/Research Experience**

Choose one option from the 3 listed: Neuroscience Laboratory Course OR Directed Study OR Honors/Senior Thesis.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
</table>
| 1. Neuroscience Laboratory Course—one course: ^1
- BIOCORE 486 Principles of Physiology Laboratory
- ANAT&PHY 435 Fundamentals of Human Physiology
- ZOOLOGY 555 Laboratory in Developmental Biology
- ZOOLOGY 604 Computer-based Gene and Disease/Disorder Research Lab
- ZOOLOGY 612 Comparative Physiology Laboratory
Lab Course in Neurobiology and Behavior

2. Directed Study—3 credits from:

- ANATOMY 699 Independent Study
- ANESTHES 699 Independent Study
- BIOCHEM 699 Special Problems
- BIOLOGY 699 Directed Studies
- B M E 399 Independent Study
- BMOLCHEM 699 Special Research Problems
- CBE 699 Advanced Independent Studies
- CHEM 699 Directed Study
- COMP BIO 699 Directed Study
- CRB 699 Independent Study
- CS&D 699 Directed Study
- ED PSYCH 699 Independent Reading Undergrad
- FAM MED 699 Directed Study
- GENETICS 699 Special Problems
- H ONCOL 699 Independent Study in Human Cancer Biology
- KINES 699 Independent Study
- MED PHYS 699 Independent Reading or Research
- MEDICINE 699 Independent Study
- MED SC-V 669 Small Animal Cardiology Rotation
- M M & I 699 Directed Study
- MOL BIOL 699 Directed Studies in Molecular Biology
- NEURSURG 699 Neurosurgery: Directed in Study in Research
- NEUROL 699 Neurology: Directed Study in Neuroscience Research
- NEURODPT 699 Independent Work
- NUTR SCI 699 Special Problems
- OBS&GYN 699 Directed Study
- ONCOLOGY 699 Special Research Problems
- OPHTHALM 699 Directed Study
- PATH 699 Independent Study
- PATH-BIO 699 Directed Study
- PEDIAT 699 Independent Study
- PHM SCI 699 Advanced Independent Study
- PHYSIOL 699 Independent Work
- POP HLTH 699 Independent Reading
- PSYCH 621 Mentored Research and Seminar
- PSYCH 699 Directed Study
- PSYCHIAT 699 Independent Study
- SURGERY 699 Independent Study
- SURG SCI 699 Directed Study
- ZOOLOGY 699 Directed Studies in Zoology

1 Lab courses may also count in the Distributed Neuroscience Coursework above.

2 Only Directed Study courses taken after—and not concurrent with—the completion of an Introductory Biology sequence are accepted in the major.

Additional Electives (if required)

Students may take additional credits from the list of Distributed Neuroscience Coursework, Independent/Directed study, or the following list, to attain 30 credits in the major:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ANAT&amp;PHY 337</td>
<td>Human Anatomy</td>
<td></td>
</tr>
<tr>
<td>ANAT&amp;PHY 338</td>
<td>Human Anatomy Laboratory</td>
<td></td>
</tr>
<tr>
<td>AN SCI/ DY SCI 362</td>
<td>Veterinary Genetics</td>
<td></td>
</tr>
<tr>
<td>AN SCI/ DY SCI 434</td>
<td>Reproductive Physiology</td>
<td></td>
</tr>
<tr>
<td>AN SCI/ F&amp;W ECOL/ ZOOLOGY 520</td>
<td>Ornithology</td>
<td></td>
</tr>
<tr>
<td>AN SCI/ GENETICS 610</td>
<td>Quantitative Genetics</td>
<td></td>
</tr>
<tr>
<td>ANATOMY 329</td>
<td>Human Anatomy-Kinesiology</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM 507</td>
<td>General Biochemistry I</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM/ NUTR SCI 510</td>
<td>Nutritional Biochemistry and Metabolism</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM 601</td>
<td>Protein and Enzyme Structure and Function</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM/ GENETICS/ MICROBIO 612</td>
<td>Prokaryotic Molecular Biology</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM/ GENETICS/ MD GENET 620</td>
<td>Eukaryotic Molecular Biology</td>
<td></td>
</tr>
<tr>
<td>BIOCHEM 625</td>
<td>Mechanisms of Action of Vitamins and Minerals</td>
<td></td>
</tr>
<tr>
<td>BMOLCHEM 314</td>
<td>Introduction to Human Biochemistry</td>
<td></td>
</tr>
<tr>
<td>BMOLCHEM 503</td>
<td>Human Biochemistry</td>
<td></td>
</tr>
<tr>
<td>BMOLCHEM 504</td>
<td>Human Biochemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>F&amp;W ECOL 401</td>
<td>Physiological Animal Ecology</td>
<td></td>
</tr>
<tr>
<td>GENETICS 466</td>
<td>Principles of Genetics</td>
<td></td>
</tr>
<tr>
<td>GENETICS 545</td>
<td>Genetics Laboratory</td>
<td></td>
</tr>
<tr>
<td>GENETICS/ MD GENET/ ZOOLOGY 562</td>
<td>Human Cytogenetics</td>
<td></td>
</tr>
<tr>
<td>GENETICS/ MD GENET 565</td>
<td>Human Genetics</td>
<td></td>
</tr>
<tr>
<td>GENETICS/ MICROBIO 607</td>
<td>Advanced Microbial Genetics</td>
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<tr>
<td>GENETICS/ BIOCHEM/ MD GENET 620</td>
<td>Eukaryotic Molecular Biology</td>
<td></td>
</tr>
</tbody>
</table>
KINES 314  Physiology of Exercise
M M & I 301  Pathogenic Bacteriology
M M & I 302  Medical Microbiology Laboratory
M M & I 341  Immunology
M M & I/ENTOM/PATH-BIO/ZOOLOGY 350  Parasitology Laboratory
M M & I/PATH-BIO/ZOOLOGY 351  Medical Mycology Laboratory
M M & I 410  Medical Mycology
M M & I 412  Medical Mycology Laboratory
M M & I/PATH-BIO 529  Immunology Laboratory
M M & I/ BIOCHEM 575  Biology of Viruses
MICROBIO 303  Biology of Microorganisms
MICROBIO 304  Biology of Microorganisms Laboratory
MICROBIO 330  Host-Parasite Interactions
MICROBIO 450  Diversity, Ecology and Evolution of Microorganisms
MICROBIO 470  Microbial Genetics & Molecular Machines
MICROBIO/SOIL SCI 523  Soil Microbiology and Biochemistry
MICROBIO 526  Physiology of Microorganisms
MICROBIO 527  Advanced Laboratory Techniques in Microbiology
MICROBIO/M M & I/PATH-BIO 528  Immunology
MICROBIO 551  Capstone Research Project in Microbiology
MICROBIO/ONCOLOGY/PL PATH 640  General Virology-Multiplication of Viruses
MICROBIO/BMOLCHEM 668  Microbiology at Atomic Resolution
NTP/NEURODPT/PSYCH 611  Systems Neuroscience
NTP 660  Neuroscience & Public Policy Seminar
NUTR SCI 431  Nutrition in the Life Span
NUTR SCI 631  Clinical Nutrition I
NUTR SCI/PHM PRAC 672  Herbs, Homeopathy, and Dietary Supplements
ONCOLOGY 401  Introduction to Experimental Oncology
ONCOLOGY/MICROBIO/PL PATH 640  General Virology-Multiplication of Viruses
PHM SCI 558  Laboratory Techniques in Pharmacology and Toxicology
PSYCH 449  Animal Behavior
PSYCH 450  Primates and Us: Insights into Human Biology and Behavior
PSYCH 505  Depth Topic in Biological Science (Comparative Psychology: What Animals Think)
PSYCH/ZOOLOGY 550  Animal Communication and the Origins of Language
ZOOLOGY/ANTHRO/BOTANY 410  Evolutionary Biology
ZOOLOGY 425  Behavioral Ecology
ZOOLOGY 430  Comparative Anatomy of Vertebrates
ZOOLOGY 470  Introduction to Animal Development
ZOOLOGY/GEOSCI 541  Paleobiology
ZOOLOGY/GEOSCI 542  Invertebrate Paleontology
ZOOLOGY 570  Cell Biology

RESIDENCE AND QUALITY OF WORK

- 2.000 GPA in all major courses
- 2.000 GPA on 15 upper-level major credits, taken in residence
- 15 credits in the major, taken on the UW–Madison campus

1 Major courses numbered 300–699 are considered upper-level.

HONORS IN THE MAJOR

Students may declare Honors in the Neurobiology Major in consultation with the Neurobiology undergraduate advisor(s).

HONORS IN THE NEUROBIOLOGY MAJOR REQUIREMENTS

To earn Honors in the Major in Neurobiology, 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 for all major courses
- Complete 14 credits, taken for Honors, with individual grades of B or better, while in residence, to include:
  - Two courses from PSYCH 454, ZOOLOGY/PSYCH 523, and ZOOLOGY 500
  - One course from the Required Neuroscience or Distributed Neuroscience course lists (above), taken for honors credit
- A two-semester Senior Honors Thesis, for a total of 6 credits, from:

<table>
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<td>&amp; BIOCHEM 682</td>
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<tr>
<td>BIOLOGY 681</td>
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</tr>
<tr>
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<td>Senior Honors Thesis</td>
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<tr>
<td>B M E 389</td>
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<tr>
<td>&amp; B M E 489</td>
<td>Honors in Research</td>
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<tr>
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<td>Senior Honors Thesis</td>
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<tr>
<td>&amp; CHEM 682</td>
<td>Senior Honors Thesis</td>
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</table>
CS&D 681 & CS&D 682
Senior Honors Thesis
and Senior Honors Thesis

GENETICS 681 & GENETICS 682
Senior Honors Thesis
and Senior Honors Thesis

H ONCOL 681 & H ONCOL 682
Senior Honors Thesis in Human Oncology
and Senior Honors Thesis in Human Oncology

NUTR SCI 681 & NUTR SCI 682
Senior Honors Thesis
and Senior Honors Thesis

PSYCH 681 & PSYCH 682
Senior Honors Thesis
and Senior Honors Thesis

ZOOLOGY 681 & ZOOLOGY 682
Senior Honors Thesis
and Senior Honors Thesis

The Senior Honors Thesis project must be approved by the Neurobiology Major Program Committee at least one month before beginning the first course (681). The project must focus on its relevance to a neuroscience-related topic. Please see the Neurobiology major website (https://neuromajor.wisc.edu) for more information.

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. Demonstrate understanding of basic concepts in biology, chemistry, mathematics, statistics, and physics.
2. Demonstrate understanding of the ionic basis for the neuronal membrane potential and action potential, and as well as the factors that determine neuronal excitability.
3. Demonstrate understanding of the basic mechanisms for synaptic transmission, neurotransmitter release, postsynaptic effects, and modulation of pre- and postsynaptic mechanisms. Predict how specific physiological and pathological conditions alter neuronal function at the cellular and synaptic levels.
4. Differentiate between examples of neuroplasticity at cellular, systems, and organismal levels.
5. Demonstrate understanding of central and peripheral neuroanatomy, basic functions of brain regions, and well-known neural pathways.
6. Demonstrate understanding of basic principles underlying motor function, sensory function (auditory, visual, touch, taste), emotion, autonomic regulation, and higher order cognitive functions (language, memory, attention, decision-making).
7. Demonstrate how experimental tools in neuroscience are used to address experimental questions, such as intra/extracellular recording, molecular biology techniques, immunohistochemical staining, fluorescent and electron microscopy, genetic manipulation, brain imaging, behavioral testing.

FOUR-YEAR PLAN

The grid below is a suggested plan for finishing your Neurobiology major in 4 years. Please see an advisor for more information, as you may have completed some of the requirements listed.

Freshman

<table>
<thead>
<tr>
<th>Credits</th>
<th>Spring</th>
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</thead>
<tbody>
<tr>
<td>Communication A</td>
<td>3 Ethnic Studies</td>
</tr>
<tr>
<td>Quantitative Reasoning A</td>
<td>3 MATH 221</td>
</tr>
<tr>
<td>Foreign Language (if required)</td>
<td>4 L&amp;S Breadth</td>
</tr>
<tr>
<td>CHEM 103 or 109</td>
<td>4 CHEM 104</td>
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<tr>
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<td>14</td>
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<td></td>
<td>16</td>
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</tbody>
</table>

Sophomore

<table>
<thead>
<tr>
<th>Credits</th>
<th>Spring</th>
</tr>
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<tbody>
<tr>
<td>BIOLOGY/BOTANY / ZOOLOGY 151</td>
<td>5 BIOLOGY/BOTANY / ZOOLOGY 152</td>
</tr>
<tr>
<td>CHEM 343</td>
<td>3 CHEM 345</td>
</tr>
<tr>
<td>INTER-LS 210 (optional)</td>
<td>1 Social Science Breadth</td>
</tr>
<tr>
<td>Social Science Breadth</td>
<td>3 PHYSICS 207</td>
</tr>
<tr>
<td></td>
<td>12</td>
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<tr>
<td></td>
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Junior

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
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<tbody>
<tr>
<td>Declare the Major</td>
<td>PSYCH 454</td>
</tr>
<tr>
<td>ZOOLOGY/PSYCH 523</td>
<td>3 Distributed Neuroscience Course</td>
</tr>
<tr>
<td>STAT 371</td>
<td>3 L&amp;S Breadth</td>
</tr>
<tr>
<td>L&amp;S Breadth</td>
<td>3 Elective</td>
</tr>
<tr>
<td>PHYSICS 208</td>
<td>5 Lab Research</td>
</tr>
<tr>
<td>Lab Research</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>17</td>
</tr>
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<td></td>
<td>16</td>
</tr>
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Senior

<table>
<thead>
<tr>
<th>Credits</th>
<th>Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distributed Neuroscience Course</td>
<td>3-4 ZOOLOGY 500</td>
</tr>
<tr>
<td>Social Science Breadth</td>
<td>3 Distributed Neuroscience Course</td>
</tr>
<tr>
<td>Electives</td>
<td>6 L&amp;S Breadth</td>
</tr>
<tr>
<td>Lab Research</td>
<td>3 Social Science Breadth</td>
</tr>
<tr>
<td></td>
<td>3</td>
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</tbody>
</table>
There are several options for fulfilling the introductory biology requirement. See listed Requirements.

2. There are several options for fulfilling the Physics requirement. See listed Requirements.

3. Students must declare a major by the time they reach 86 credits.

4. It is recommended that students in the Neurobiology major participate in multiple semesters of research.

**NEUROBIOLOGY MAJOR ADVISING**

The advisors for the neurobiology major are committed to providing students with first-rate guidance through the major and to graduation. Also, the neurobiology major advisors are dedicated to helping a student focus their future plans after undergraduate study. If you are interested in declaring the neurobiology major, make an appointment to discuss this.

**CONTACT INFORMATION**

Catherine Auger  
Birge Hall, Room B156  
430 Lincoln Drive  
cauger@wisc.edu  
Scheduling Assistant (https://calendar.wisc.edu/scheduling-assistant/public/profiles/GvjvmzDO.html)

Virginia Jackson  
Birge Hall, Room 141  
430 Lincoln Drive  
vjackson4@wisc.edu  
Scheduling Assistant (https://calendar.wisc.edu/scheduling-assistant/public/profiles/aBNbotSX.html;jsessionid=53F9D957BE6099BFC895E0A8487F3B94,primary)

India Viola  
Birge Hall, Room 244  
430 Lincoln Drive  
irviola@wisc.edu  
Scheduling Assistant (https://calendar.wisc.edu/scheduling-assistant/public/profiles/nPLtQRRK.html)

**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 Hardin (chair, jdhardin@wisc.edu), Bement, Blair, Gammie, Halloran, Ives, Lee, Newmark, Porter, Ritters, Stanley, Stretton, Turner and Vander Zanden

Associate Professors Amann, Damschen, Grinblat, and Orrock

Assistant Professors Dugan, Sharma and Wolman

Adjunct Professor Peckarsky

**Neurobiology Major Programming Committee:** Professors Gammie (Integrative Biology, Chair), Bakshi (Psychiatry), Dent (Neuroscience), Postle (Psychology).