Why study Neuroscience?
Neuroscience is the study of the nervous system. It is a cross-discipline science that involves the fields of biology and psychology to investigate how the nervous system develops and functions on a cellular level as well as the mechanisms that underlie behavior, mental disorders and disease. The overall goals of this major are to: (1) provide a course of study in the discipline of Neuroscience that integrates cell/molecular and behavioral components of the field; and (2) provide a course of study that prepares students for graduate training in the field of Neuroscience. An understanding of how the nervous system functions spans both molecular and cellular activity that is best taught by cell and molecular neurobiologists, and behavior that is best taught by psychologists. This interdisciplinary program gives students the best of both of these worlds.

Who should major in Neuroscience?
Any student who wishes to pursue a career studying the nervous system or behavior. This is an excellent major for anyone interested in pre-health careers, graduate studies, or industry careers.

How do I declare?
Students interested in neuroscience are encouraged to meet with an advisor to discuss their academic plans as soon as possible! Students need not have completed all of the major prerequisites to declare, but should usually have completed the biology introductory sequence with a 2.0 or better and be in good academic standing. Make an advising appointment online through the Neuroscience website: www.lsa.umich.edu/neurosci.

What courses should I take first?
The biological science introductory sequence for Neuroscience consists of: BIOLOGY 171, and BIOLOGY 172 or 174 (Students with an appropriate AP score receive credit for BIOLOGY 195, which is the equivalent of BIO 171 & 172/174, but does NOT grant credit for 173.) Students can take either 171 or 172/174 first. Although BIO 173 is not required for Neuroscience, many 200 level or above BIO and MCDB lab courses require BIO 173 as a prerequisite.

<table>
<thead>
<tr>
<th>BIOLOGY 171</th>
<th>BIOLOGY 172 or 174 (prerequisite: prior or concurrent credit for CHEM 130)</th>
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<tr>
<td>...focuses on ecology, biodiversity, and genetics and evolutionary processes. Students engage with biological hypotheses dealing with prominent current issues such as human evolutionary origins, emerging diseases, conservation biology, and global change.</td>
<td>...focuses on how cells, organs, and organisms work. (174 covers the same material as 172 but is geared toward students who prefer a more problem-solving approach to understand biology, rather than a more traditional lecture-based course.)</td>
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What other types of classes are required?
Neuroscience requires introductory study in organic chemistry. These courses provide the foundational knowledge required for the advanced study of neuroscience. Required courses within the program include neurobiology, biopsychology, genetics, and biochemistry. All neuroscience students obtain experience in a laboratory setting with the completion of at least two lab courses. The Neuroscience major also includes two quantitative cognate classes.

How should I choose my electives? Are there concentrations or tracks within the major?
There are no defined concentrations within the major, but the flexibility of choices within the electives groups allows students to pursue the focus that interests them most. If you are interested in the cellular and molecular side of neurobiology, then your group C and D courses should focus on MCDB classes. If your interests are in the biopsychology side, then your group C and D courses should focus on psychology classes. Meet with an advisor to discuss your options!

How do I get involved in research?
Determine what you may be interested in through your introductory courses and search the faculty directory of both MCDB and Psychology. All faculty will have their research interest listed in the directory. When contacting faculty to sponsor you for an independent study course or undergraduate research assistant position, we recommend that you treat it as if it were a professional job interview. It is expected that you have done some background research on the faculty, their publications and current research projects. Explain how you will be an asset to the lab, and how this experience will help you as you develop your career path. Provide a resume with examples of leadership, self-motivation, and dedication to work tasks. Contact faculty early if you plan to register for course credit. Students interested in research should plan to spend at least two semesters working in a lab. Therefore, students need to contact faculty early in their career to pursue these opportunities,
which are an asset to Psychology graduate admission applications (and often the most important component of the application).

What are the requirements for Honors?
The Neuroscience B.S. degree is the basis for the Honors degree in Neuroscience. Students must elect two terms of independent research (under PSYCH 424 & 426 for those with Psychology mentors, MCDB 300/400 for those with MCDB mentors), maintain an overall and major GPA of 3.4, complete an Honors thesis, and give a research presentation based on their Honors work.

Undergraduate research for an honors concentration in neuroscience must be completed on a topic in neuroscience that is approved by the concentration steering committee. If students are uncertain if their research topic fits this requirement they may contact the chair of the neuroscience concentration steering committee for guidance.

Prior to applying to the Neuroscience Honors Program students must identify a research mentor in the Department of Psychology or MCDB. See the list of possible mentors in the Undergraduate Program in Neuroscience office. (Students may conduct Honors research with faculty in other units on the University of Michigan campus, but must have a formal co-sponsor relationship with an approved neuroscience faculty member in Psychology or MCDB.)

Students apply to the Honors Program in Neuroscience by submitting a Neuroscience Honors Application (http://www.lsa.umich.edu/biology/academics/honorsprogram) with a research proposal. Honors applications are due by November 1, March 1, or July 1 for graduation in fall, winter, or summer term, respectively. Students are encouraged to apply early, preferably by the end of the second week of the term that the honors thesis will be submitted.

How do I find out about internships, study abroad, or summer programs?
For information on internships and other opportunities: http://www.lsa.umich.edu/neurosci
For information on study abroad: http://www.internationalcenter.umich.edu/swt/study/

Can I transfer courses from another institution?
Yes, you will work with the applicable department for the transferring subject to have your course evaluated (i.e., the Psychology department for PSYCH classes) and with the transferring institution to issue your official transcript to UM. Check the Undergraduate Program in Neuroscience website for more detailed instructions.

What can I do with my Neuroscience undergraduate degree?
The undergraduate degree in neuroscience is a great starting point for graduate programs in neuroscience, psychology, or biology. The degree will also prepare students for medical, dental, veterinary or pharmacy school. Other possible jobs are in health services, industry, government, teaching, and sales.

Related Student Groups:

Neuroscience Students Association (NSA)
The Neuroscience Students Association is a student organization for students with an interest in neuroscience. This organization provides networking opportunities, seminars, and exposure to the depth of neuroscience. The organization also aims to actively participate in service to its community and provide the public with information on neuroscience, health, and general science topics. They hope to broaden their horizons of members by exposing them to medicine, public health, research, and engineering. Neuroscience is, at its very core, an interdisciplinary subject. It requires a relatively deep understanding of biology, chemistry, physics, and psychology. Beyond that, when it is crossed with computer programming, electrical engineering, biomedical engineering, or animal studies, it gains an even broader scope of possibilities. The organization hopes to expose students to the many facets of this broad, advancing field. Email: nsaleadteam@umich.edu

Biology Student Alliance (BSA)
The Biology Student Alliance is a student organization intended for Neuroscience, CMB, Biology, Plant Biology, Microbiology and Biochemistry concentrators, as well as any Pre-Med or science-oriented students who are interested in learning more about MCDB-related topics. BSA provides opportunities for undergraduates to enhance their learning in the natural sciences and gain exposure to various careers in scientific research and health-related fields. BSA aims to foster scientific discussion and stimulate innovative thinking in biology. We seek to build and sustain meaningful relationships among like-minded peers. We offer informal tutoring, academic advising, community service events (such as presenting simple, exciting demos to elementary students), and coordinate events with various faculty guest speakers to help introduce undergraduates to various research fields. In addition, we provide a space for students to present their own research in a low-pressure environment and give participants constructive feedback to help acquire skills that will be applicable to their current and future academic/professional careers. Email: BSA-Board@umich.edu for more information.
### NEUROSCIENCE ELECTIVES

#### Group A: Molecular and Cellular Neuroscience

**Elect at least two courses. At least one must be from Group A-1.**

**Group A-1: 300-level MCDB Elective (BIOLOGY 222, no longer offered, may be used to satisfy this requirement)**

- MCDB 351 (4) Synapses
- MCDB 352 (4) Neurobiology of Sensory and Motor Systems

**Group A-2: Additional MCDB Elective**

- MCDB 401 (3) Advanced Topics (applicable sections only)
- MCDB 402 (3) Molecular Biology of Pain and Sensation
- MCDB 403 (3) Molecular and Cell Biology of the Synapse
- MCDB 418 (3) Endocrinology
- MCDB 422 (3) Brain Development, Plasticity and Circuits
- MCDB 426 (3) Molecular Endocrinology
- MCDB 450 (3) Genetics and Molec. Bio. of Complex Behavior
- MCDB 455 (3) Cell Biology of Neurodegeneration
- MCDB 456 (3) Genes, Circuits, and Behavior

#### Group B: Behavioral Neuroscience

**Elect at least two courses.**

- PSYCH 240 (4) Introduction to Cognitive Psychology
- PSYCH 245 (4) Introduction to Cognitive Neuroscience
- PSYCH 345 (4) Introduction to Human Neuropsychology
- PSYCH 402 (2-4) Special Problems in Psychology
- PSYCH 431 (3) Neuro. of Attention and Attentional Disorders
- PSYCH 433 (3) Biopsychology of Motivation
- PSYCH 434 (3) Biopsychology of Learning and Memory
- PSYCH 435 (3) Biological Rhythms and Behavior
- PSYCH 436 (3) Drugs of Abuse, Brain, and Behavior
- PSYCH 437 (3) Current Topics in Biopsych. (app. sections only)
- PSYCH 438 (3) Hormones and Behavior
- PSYCH 531 (3) Advanced Topics in Biopsychology
- PSYCH 532/ANATOMY 541/ PHYSIOL 541 (4) Mammalian Reproductive Endocrinology
- PSYCH 533/NEUROSCI 520 (3) Sleep, Neurobiology, Medicine, & Society
- PSYCH 541 (3) Advanced Topics in Cognitive Neuroscience
- PSYCH 531 (3) Advanced Topics in Cognitive Neuroscience
- PSYCH 420 (1-3, can only be elected once) Faculty-Directed Advanced Tutorial Reading for Psych as a Natural Science
- PSYCH 421 (2-4) Honors Research I for Prim. Research I (applicable sections only)
- PSYCH 424 (3) Honors Research I for Psych. as a Nat. Science**
- PSYCH 425 (3) Honors Research II for Psych. as a Nat. Sci.**

*If any STATS course is counted in Group C, it cannot be double-counted in Group E, and vice versa*

#### Group C: Additional Courses

**Elect no more than 2 courses.**

- BIO 205 (3) Developmental Biology
- EEB 492 (4) Behavioral Ecology (BIOSTATION: 5 credits)
- MCDB 397/EEB 397 (3) Writing in Biology
- MCDB 401 (3) Advanced Topics (applicable sections only)
- MCDB 405 (3) Molecular Basis of Development
- MCDB 408 (3) Genomic Biology
- MCDB 411 (3) Protein Structure and Function
- MCDB 417 (3) Chromosome Structure and Function
- MCDB 427 (4) Molecular Biology
- MCDB 428 (4) Cell Biology
- MCDB 435 (3) Intracellular Trafficking
- MCDB 436 (3) Immunology
- MCDB 441 (3) Cell Biology and Disease
- MCDB 469 (3) Signal Transduction
- MCDB 471 (3) Advanced Methods in Biochemistry
- PSYCH 346 (3) Learning and Memory
- PSYCH 420 (1-3, can only be elected once) Faculty-Directed Advanced Tutorial Reading for Psych as a Natural Science
- PSYCH 421 (2-4) Honors Research I for Prim. Research I (applicable sections only)
- PSYCH 424 (3) Honors Research I for Psych. as a Nat. Science**
- PSYCH 425 (3) Honors Research II for Psych. as a Nat. Sci.**

*If any STATS course is counted in Group C, it cannot be double-counted in Group E, and vice versa*

#### Group D: Laboratory Requirement

**Elect at least two courses, with at least one being from D1, for a min. of 5 cred. total**

**Group D1: Method-based laboratory courses**

**Elect at least one course.**

- BIO 226 (2) Animal Physiology Laboratory
- MCDB 306 (3) Introductory Genetics Laboratory
- MCDB 308 (3) Developmental Biology Laboratory
- MCDB 419 (3) Endocrinology Laboratory
- MCDB 423 (3) Cellular and Molecular Neurobiology Laboratory
- MCDB 429 (3) Cellular and Molecular Biology Laboratory

**Group D2: Research-based laboratory courses**

- MCDB 300/400 (2 - 3) Undergraduate Research*
- PSYCH 326 (2 - 4) Research for Psychology as a Natural Science
- PSYCH 331 & 332 (2 & 3) Labs in Biopsych. (max. 3 cr. total)
- PSYCH 422 (3) Adv. Research for Psych. as a Natural Science
- PSYCH 428 (2-4) Senior Thesis Laboratory
- PSYCH 424 (3) Honors Research I for Psych. as a Nat. Science**
- PSYCH 426 (3) Honors Research II for Psych. as a Nat. Sci.**

*Max. of 3 cr. of ind. research may count toward the major. Must be taken for a min. of 2 cr. and be completed in a single term.

**Required for Neuroscience Honors with Psychology mentor**

#### Group E—Quantitative Cognate Requirement

**Elect two courses, 6 credits minimum.**

- MATH 115, 120, 185 (or equivalent) Calculus I
- MATH 116, 121, 156, 176, and 186 (or equivalent) Calculus II
- Any MATH course that requires one of the above-listed Group E
- MATH courses as a prerequisite
- PHYSICS 126, 235, 240, 260 General Physics II (or Honors)
- PHYSICS 448 (3) Mathematical Psychology
- STATS 250* (4) Introduction to Statistics and Data Analysis
- STATS 400* (4) Applied Statistical Methods
- STATS 401* (4) Applied Statistical Methods II

*If any STATS course is counted in Group E, it cannot be double-counted in Group C, and vice versa.*
# NEUROSCIENCE MAJOR REQUIREMENTS

## NEUROSCIENCE PREREQUISITES:

**Introductory Biology Sequence:**

<table>
<thead>
<tr>
<th>TERM</th>
<th>COURSE</th>
<th>GRADE</th>
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<tbody>
<tr>
<td>□ Complete Sequence A or B:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A: BIO 171 &amp; 172 or 174</td>
<td></td>
<td></td>
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<tr>
<td>B: BIO 195 (AP)</td>
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**Chemistry Sequence:**

| | |
| □ CHEM 210 | |
| □ CHEM 211 | |
| □ CHEM 215 | |
| □ CHEM 216 | |

## NEUROSCIENCE MAJOR:

### Core Courses

- □ Animal Physiology & Neurobiology: BIO 225
- □ Introduction to Biopsychology: PSYCH 230
- □ Biochemistry: Choose from: MCDB 310, BIOLCHEM 415, or CHEM 351
- □ Genetics: BIO 305

### Electives (6 courses, 18 credits minimum)

- □ Molecular & Cellular Neuroscience - Group A (minimum of 2 courses, at least one from A-1)
  - □ 300-level – Group A1
  - □ Additional Elective – Group A1 or A2
- □ Behavioral Neuroscience - Group B (minimum of 2 courses)
- □ Additional Courses - Group C (maximum of 2 courses)

### Lab Courses – Group D (2 courses, 5 credits minimum, at least one from D-1)

- □ Methods-Based Lab – Group D1
- □ Additional Lab – Group D1 or D2

### Quantitative Cognate – Group E (2 courses, 6 credits minimum)

- □ 2 courses from list of MATH, PHYSICS, PSYCH, and STATS Group E course options

## Total Units and GPA Requirement for Neuroscience

- □ Minimum 36 cr. in Major (200-level & above)
  - = Core Courses (13–14 cr.) + A, B, C (min. 18 cr.) + D1, D2 (min. 5 cr.)

- □ Minimum 2.0 GPA in Concentration
  - (GPA is calculated from all courses used for major requirements, and all courses in BIOLOGY, MCDB, and Natural Science PSYCHOLOGY courses, NOT including the 100-level quant. requirement or CHEM prerequisites.)

## HONORS STUDENTS ONLY:

- □ Minimum 3.4 Major GPA
- □ Minimum 3.4 Cum. GPA
- □ Independent Research (2 terms required, more recommended)
  - PSYCHOLOGY focus area: PSYCH 424 & 426
  - MCDB focus area: MCDB 300 and/or MCDB 400