

New Program Proposal

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Changes proposed by: ndudukov

General Information

Give a brief (1-2 paragraphs) overview of the proposed credential, including its disciplinary foundations and connections, its focus and learning objectives for students, and the specific degree (e.g. bachelors, masters, doctorate) and/or credentials (e.g. major, certificate, minor, concentrations) to be offered. This should be based largely on your descriptions in the following sections but it should be shorter than their combined length. Moreover, it should use language that is capable of communicating your ideas to audiences increasingly distant from your academic field as your proposal moves through the review process.

The proposed Neuroscience degree program is an interdisciplinary major, which will be jointly administered by Biology (BI), Human Physiology (HPHY), and Psychology (PSY) beginning in Fall 2020. The Neuroscience major will offer rigorous training to undergraduates interested in studying brain and behavior and will address a critical need to serve students with interests in this broad discipline, allowing them to earn a Bachelor's degree in Neuroscience. Majors will take a required set of core neuroscience courses, a supporting set of coursework in biology, chemistry, human physiology, math, physics, and psychology, and upper-division coursework in three different areas of neuroscience. The training will conclude with successful completion of advanced coursework in programming or computational techniques or an in-depth research experience in a neuroscience lab, in recognition of the skills required for neuroscience-related careers. Upon completion of the Neuroscience major, graduates will demonstrate strong content knowledge in the field of neuroscience, critical thinking and scientific literacy skills, quantitative and analytical skills, and an ability to communicate effectively about neuroscience research. Neuroscience majors will be well-prepared for careers in scientific research, medicine, and allied health professions, as well as science-related government, nonprofit, and industry jobs.

Primary Proposer

Nicole Dudukovic

Is there a co-proposer for this proposal?

Yes

Co-proposer(s)

Name	Home Unit
Adrienne Huxtable	Arts & Sciences, College of
Philip Washbourne	Arts & Sciences, College of

Home department

Psychology

College

Arts & Sciences, College of

Additional Department Affiliations

Department
Human Physiology
Biology

Level

Undergraduate

Program Type

Degree

Degree Type

Bachelors Degree

By default, the program will be approved for the Bachelor of Arts and Bachelor of Science. If you are only requesting one of these, please indicate below:

Primary Location

UO main campus

Program Delivery Format

Traditional classroom/lab

Does the program represent a collaboration of two or more university academic units?

No

Proposed Identification**Full Title**

Neuroscience

What's your desired effective date?

2020-2021

Relationship to Institutional Mission and Statewide Goals

How is the program connected with the UO's mission, signature strengths and strategic priorities?

The interdisciplinary Neuroscience major will take advantage of existing shared interests and faculty excellence in the field of neuroscience at the University of Oregon, leveraging the combined strength of the Biology, Human Physiology, and Psychology departments. Most major research universities in the United States already have undergraduate neuroscience majors; in fact, 26 of our 32 AAU Peer Institutions have, or are preparing to launch, a neuroscience major or comparable major (e.g., neurobiology). By offering a Neuroscience major at the University of Oregon, we will better serve students who are interested in the field of neuroscience and must currently choose Biology, Human Physiology, or Psychology as their major. The Neuroscience major will also recruit talented undergraduate students to the University of Oregon and offer an additional undergraduate major for students interested in careers in research, medicine, or other health professions.

How will the proposal contribute to meeting UO and statewide goals for student access and diversity, quality learning, research, knowledge creation and innovation, and economic and cultural support of Oregon and its communities?

Faculty affiliated with the Neuroscience major are advocates for promoting diversity and increasing the presence of students who are traditionally underrepresented in STEM fields. For example, Adrienne Huxtable (HPHY) and Brice Kuhl (PSY), are both the heads of their departmental diversity committees and are on the CAS Natural Sciences Diversity Leadership committee. Human Physiology, Biology, and Psychology have individually been departments leading the charge on many improvements for diversity, equity, and inclusion on campus. Based on strategies developed in the diversity committees, neuroscience faculty will make efforts to recruit women and minorities into the program.

The Neuroscience major emphasizes research throughout the required coursework. All majors will be encouraged to join a research lab affiliated with the university's Institute of Neuroscience (ION), and majors who are underrepresented in the natural sciences will be encouraged to apply for research and mentorship opportunities, such as SCORE (Students of Color Opportunities for Research Enrichment), the McNair Scholars program, and JUMP (Joint Undergrad-Grad Mentorship Program).

How will the proposal meet regional or statewide needs and enhance the state' capacity to:

- improve educational attainment in the region;
 - respond effectively to social, economic and environmental challenges and opportunities;
- and
- address civic and cultural demands of citizenship?

The Neuroscience major has been strategically designed to be accessible to all incoming students, including transfer students. The foundational courses in natural sciences as well as one of the two required math courses are all 200-level courses and can be completed at other institutions, including community colleges. Thus, students will be able to enter the program in the third year and complete the remaining 54 credits over a two year period. The core neuroscience sequence can be taken out of order to accommodate transfer students

who have not yet completed the lower division courses in Human Physiology, and doing so will not compromise a student's ability to succeed in any of the core courses.

Advanced skills courses and/or research experience are a required component of the Neuroscience major in order to ensure that our graduates leave with the skills and competencies necessary for pursuing a career in a neuroscience-related field, such as medicine, scientific research, medical technology, health policy, public health, and social services. By matriculating more students with strong quantitative and analytical skills, we will meet the increasing demand for these skills in the workplace.

Program Description

Is there a core set of required courses?

Yes

What is the core set of required courses and what is the rationale for giving these courses this prominent role? What are the central concepts and/or skills you expect students to take from the core?

Neuroscience is a broad field, but it can be broken down into three main levels of inquiry: Molecular/Cellular Neuroscience, Systems Neuroscience, and Cognitive Neuroscience. The core set of required courses for Neuroscience majors includes a sequence of courses from each of the three contributing departments that covers these three levels. Majors will take HPHY 321 Human Anatomy I and HPHY 322 Human Physiology I to gain in-depth knowledge of the human nervous system using a systems-level approach. Majors will then take PSY 304 Biopsychology, which takes a behavioral and cognitive neuroscience approach, exploring how our underlying physiology influences a wide range of human behaviors. The sequence culminates with BI 360 Neurobiology, where majors will explore neuronal functioning at the molecular and cellular level. After taking these courses, majors will have a nuanced understanding of the nervous system as well as the methods that are used to gain knowledge about nervous system functioning at different levels of inquiry.

What is the relationship between upper-division courses and the lower-division curriculum? For example, are fundamental principles introduced in the lower division and then applied to increasingly complex problems at the upper-division? This vertical architecture is common in the sciences, but is by no means universal. In the humanities, a more horizontal structure is often appropriate. For example, students might read and analyze literature at each level (100-400), but do so with increasing sophistication and the capacity to draw on a widening array of literary forms and ideas.

Lower-division courses in the natural sciences will all introduce fundamental principles and skills that will be applied in the upper-division coursework. The lower-division courses along with the set of required upper-division core courses will provide majors with the necessary critical thinking and problem-solving skills required for succeeding in the more complex and more specific upper-division elective courses.

Are there specific course-to-course prerequisites that help students extend or link ideas or are the intellectual connections among courses in your major more general?

Lower-division foundation courses in Biology, Chemistry, Physics, Human Physiology, and Psychology will provide Neuroscience majors with a knowledge base that they will expand on in the upper-division coursework in the major. HPHY 212 Scientific Investigations in Physiology and PSY 302 Statistical Methods in Psychology will allow majors to hone their scientific literacy skills and give them a solid understanding of statistical principles, which will allow them to critically read and interpret empirical research articles in upper-division elective courses. Similarly, HPHY 211 Medical Terminology provides the terminology necessary for success in HPHY 321 Human Anatomy and HPHY 322 Human Physiology as well as other advanced courses in the major.

Are there tracks or concentrations within the credential? If so, do these start from a common core or are they differentiated from the beginning?

There are no formal tracks or concentrations in the Neuroscience major. We promote breadth in the major by requiring students to choose one course from each of three areas (Molecular/Cellular/Developmental, Systems, and Cognitive), and we promote depth by requiring a minimum of 12 credits of 400-level coursework and requiring advanced skills or research experience. Students are welcome to informally specialize or concentrate their studies in a specific area.

Course of Study

Course of Study

As outlined below, the Neuroscience majors consists of the following components: 1) foundation courses in the natural sciences; 2) math and statistics coursework; 3) life science fundamentals; 4) a core neuroscience sequence; 5) upper-division elective courses; and 6) advanced skills courses and/or research experience. The total number of credits is 104-107 (depending on whether majors complete the General Biology Sequence or the Biology Honors Sequence).

Foundation courses in natural sciences(46-49 credits)

- General Biology Sequence: BI 211, 212, and 214 (12 credits) OR Biology Honors Sequence: BI 281H, 282H, 283H (15 credits)
- General Chemistry Sequence: CH 221, 222, 223 OR Chemistry Honors Sequence: CH 224H, 225H, 226H (12 credits)
- Introductory Physics Sequence: PHYS 201, 202, 203 OR Foundations of Physics Sequence: PHYS 251, 252, 253 (12 credits)
- General Chemistry Laboratory: CH 227, 228, 229 OR General Physics Laboratory: PHYS 204, 205, 206 (6 credits)
- Mind & Brain: PSY 201 (4 credits)

Math and statistics courses(8 credits)

- MATH 246 or 251
- PSY 302 Statistical Methods in Psychology OR MATH 425 Statistical Methods I OR ANTH 470 Statistical Analysis of Biological Anthropology

Life science fundamentals(8 credits)

- HPHY 211 Medical Terminology
- HPHY 212 Scientific Investigations in Physiology

Core neuroscience sequence(18 credits; recommended, but not required, to be taken in this order)

- HPHY 321 Human Anatomy I & HPHY 322 Human Physiology I (Fall)
- PSY 304 Biopsychology (Winter)
- BI 360 Neurobiology (Spring)

Upper-division elective courses(16 required credits with at least 12 credits from 400-level courses; at least one course from each of the three areas)

Molecular/Cellular/Developmental

- BI 320 Molecular Genetics
- BI 322 Cell Biology
- BI 328 Developmental Biology
- BI 356 Animal Physiology
- BI 422 Protein Toxins in Cell Biology
- BI 427 Molecular Genetics of Human Disease
- BI 463 Cellular Neuroscience
- BI 466 Developmental Biology
- HPHY 337 Clinical Pharmacology
- HPHY 432 Neural Development

Systems

- BI 353 Sensory Physiology
- BI 399 Visual System
- BI 410 Auditory Systems
- BI 461 Systems Neuroscience
- HPHY 333 Motor Control
- HPHY 412 Sleep Physiology
- HPHY 433 Neurophysiology of Concussion

- HPHY 434 Movement Disorders
- HPHY 436 Clinical Neuroscience
- PSY 445 Brain Mechanisms of Behavior
- PSY 450 Hormones & Behavior

Cognitive

- BI 410 Neural Basis of Cognition
- PSY 305 Cognition
- PSY 348 Music & the Brain
- PSY 383 Psychoactive Drugs
- PSY 433 Learning & Memory
- PSY 436 Human Performance
- PSY 438 Perception
- PSY 440 Psycholinguistics
- PSY 449 Cognitive Neuroscience
- PSY 458 Decision Making
- PSY 475 Cognitive Development

Advanced skills courses and research experience(8 required credits)

- BI 401 Research, BI 403 Thesis, BI 407 Neuroscience Seminar, BI 410 Introduction to Programming for Biologists, BI 410 Matlab for Biologists, BI 410 Analysis Neural Data, BI 485 Techniques in Computational Neuroscience, CIS 372M Machine Learning for Data Science, CIS 472 Machine Learning, HPHY 401 Research, HPHY 403 Thesis, PSY 401 Research, PSY 403 Thesis, PSY 412 Applied Data Analysis

Criteria for Honors

To graduate with Honors in Neuroscience, the following requirements must be met:

1. A completed Neuroscience Honors application with signature of a faculty research advisor from BI, HPHY or PSY
2. Completion of all Neuroscience major requirements
3. A minimum 3.5 GPA in all courses applied to the major
4. At least three credits in BI 403, HPHY 403, or PSY 403 Thesis (*These credits may be applied to the advanced skills courses and research experience requirement*).
5. Completion of an honors thesis under supervision of a committee, consisting of one BI, HPHY, or PSY faculty member and at least one other committee member (Ph.D. student, postdoctoral scholar, or faculty) from BI, HPHY, or PSY.

Expected Learning Outcomes For Students And Means Of Assessment

Principle Learning Outcome (Concept or Skill)	Part of curriculum where this is introduced	Part of curriculum where this is developed	How students demonstrate mastery
Demonstrate broad-based content knowledge and understanding of terminology and concepts in neuroscience at multiple levels of organization	200-level foundational natural science courses	300-level neuroscience core courses and upper-division electives	Successful completion of the upper-division electives
Critically read and evaluate scientific information	200-level foundational natural science courses	Life science fundamentals, 300-level neuroscience core courses, and upper-division electives	Successful completion of the upper-division electives
Apply data analysis skills to understand neuroscience information	Math and statistics courses AND life science fundamentals	Advanced skills courses and research experience	Successful completion of advanced skills courses and research experience
Communicate clearly and effectively about neuroscience information	200-level natural science courses and life science fundamentals	300-level neuroscience core courses and upper-division electives	Successful completion of the upper-division electives

What is the nature and level of research and/or scholarly work expected of program faculty which will be indicators of success in those areas?

The tenure-track and Career faculty teaching in the Neuroscience program include faculty from Biology (BI), Human Physiology (HPHY) and Psychology (PSY), many of whom are researchers affiliated with the Institute of Neuroscience. All of the faculty are currently demonstrating successful instruction and/or scholarship in their home departments.

Explain the methods by which the learning outcomes will be assessed and used to improve curriculum and instruction.

We will survey students in our three core courses to evaluate the course curriculum at the end of each term to ensure that course learning objectives are being met. We will also survey graduating seniors in the Neuroscience major to evaluate the major more holistically and will track graduates of our major to determine the number of students who are receiving employment as well as the additional skills they require but did not receive in our program. We will also maintain contact with graduates who remain in neuroscience-related careers to ensure that our major is meeting current needs.

Accreditation

Is or will the program be accredited?

No

Please explain why accreditation is not being sought:

Accreditation is not available for undergraduate programs in neuroscience.

Need for this Credential

What are the expected degrees/certificates over the next five years.

Number of Degrees:

	Year 1	Year 2	Year 3	Year 4	Year 5
	20	30	40	45	50

What are possible career paths for students who earn this credential? Estimate the prospects for success of graduates in terms of employment, graduate work, licensure, or other professional attainments, as appropriate.

The main objective of the proposed Neuroscience major is to provide students with rigorous training in neuroscience, preparing them for graduate programs in neuroscience as well as a wide variety of neuroscience-related careers. Possible career paths include medicine, physical therapy, occupational therapy, other health professions, graduate programs through the Institute of Neuroscience or at other research universities, and technology or health-related industry jobs.

Are there similar or related programs currently offered at the University of Oregon?

No

Program Integration And Collaboration

Are there closely-related programs in other Oregon public or private universities?

Yes

List similar programs and indicate how the proposal complements them. Identify the potential for new collaboration.

No public institutions in the state of Oregon currently offer a Neuroscience major. Reed College is the only institution of higher education in Oregon that offers a Neuroscience major. Lewis & Clark College offers a Neuroscience minor, Portland State University offers a concentration in Neuropsychology/Neuroscience within the Psychology major, and Oregon State University offers a Neuroscience option within the Biochemistry & Biophysics major.

We are in conversation with Oregon State University about any possibilities for collaboration.

If applicable, explain why collaborating with institutions with existing similar programs would not take place.

Because Reed College is a small liberal-arts college and not a large research university, opportunities for collaboration are limited.

Describe the potential for impact on other institution's programs.

Since we would be the only public institution in Oregon offering a Neuroscience major, impact on other institutions' programs would be minimal.

Describe how students will be advised in the new program.

Routine advising will be handled by the advising staff in Tykeson Hall. The Neuroscience program will have a director who will serve as a liaison with the Tykeson Hall staff for non-routine issues that arise.

What other additional staff are needed to support this program?

The major will have a program director and a small program guidance committee, comprised of one faculty member from each of the three departments. No additional faculty will be required in the short term, as the proposal is based on courses that are already being taught. As the major grows, we might need to increase the capacity of the required courses in the three departments. The College of Arts & Sciences has indicated a commitment to funding extra instruction as need.

Are special facilities, equipment, or other resources required because of the change (e.g., unusual library resources, digital media support,

No

Financial Sustainability

What financial resources are needed to support this proposal? Identify the resources currently available as part of existing UO programs or reallocations within existing budgets. Are additional resources needed?

Our plan is that the Neuroscience major will follow the model of General Science and General Social Science, and we expect it to have similar time requirements. However, this will depend heavily on how popular the Neuroscience major is.

To that end we expect a steady state budget for:

- A program director (at approximately .33 FTE if NTTF). See schedule here for guidelines: <https://casweb.uoregon.edu/department-head-and-large-program-director-compensation-schedule>.
- Partial FTE (.25, for example) for classified staff administrative help
- S&S funding on the order of \$2000-\$7000 depending on size and on how we handle graduation down the road.

Provide a plan that shows how long-term financial viability of the program is to be achieved, addressing anticipated sources of funds, the ability to recruit and retain faculty, and plans for assuring adequate library support over the long term.

Business Plan Description

The only applicable long-term issue is if the major becomes sufficiently popular so that additional instructional resources are required. In that case, the College of Arts & Sciences will expect that budgetary resources generated by those student credit hours will be sufficient to cover additional instruction.

Describe your plans for development and maintenance of unique resources (buildings, laboratories, technology) necessary to offer a quality program.

N/A

What is the targeted student/faculty ratio? (student FTE divided by faculty FTE)

Not applicable because there are no dedicated faculty for this major. We expect that the student/faculty ratio for the three participating departments (Biology, Human Physiology, and Psychology) will remain roughly similar after folding in Neuroscience majors.

What are the resources to be devoted to student recruitment?

We will work with enrollment management once the major is authorized so that this can be a recruitment draw in their efforts to recruit undergraduates both within the state and out of state.

If grant funds are required to launch the program, what does the institution propose to do with the program upon termination of the grant?

Not applicable

Other Program Characteristics

Must courses be taken for a letter grade and/or passed with a minimum grade to count toward the proposed major? If so, please list the courses and the requirements of each. Although there is variation in detail, UO majors typically require that most of the courses be taken for a letter grade (not “pass/no pass”) and that the grade be C- or better.

All courses counted towards the Neuroscience Major requirements must be taken for a letter grade and passed with a grade of C or better.

How much course overlap will be allowed to count toward both the major and some other credential a student might be earning (a minor, certificate, or another major)? If there are specific credentials with overlap limits, please list those and the limits.

There are no overlap limitations. We believe that if students complete all of the requirements for the neuroscience major, then they have earned a degree in neuroscience, whether or not they are also using some of the same courses for a major in Biology, Human Physiology, or Psychology. While there is substantial overlap in the requirements for the Neuroscience major with those of Biology and Human Physiology, a student would need to

take an additional 20+ credits to double major. We believe this is sufficient independence to warrant unrestricted overlap.

Does your proposal call for new courses, or conversion of experimental courses into permanent courses? If so, please list courses in the text box below and indicate when they will be submitted to UOCC for approval:

Our proposal does not call for any new courses.

Will admission to the program be limited?

No

Will students be required to apply for entry to this program?

No

Additional Requirements (Will Appear in Catalog)

All courses counted towards the Neuroscience Major requirements must be taken for a letter grade and passed with a grade of C or better.

Residency Requirements (Will Appear in Catalog)

At least 34 credits of coursework applied to the major must be taken at the University of Oregon.

Attach Additional Files

Neuroscience_Major_Response_to_UG_Council.pdf

Hal_NeuroscienceMemo.pdf