

July 25, 2011

Council on Academic Affairs
Subcommittee B
The Ohio State University
Columbus, Ohio 43210
Re: Neuroscience BS

Dear Subcommittee Members:

Thank you very much for taking the time to read our proposal so carefully and for the valuable feedback that you provided during our recent meeting. This cover letter details our responses to each of the issues that you raised. In terms of structure, each revision/clarification request raised by the subcommittee will be broken down into three parts: **"Issued Raised"** by the subcommittee, **"Neuroscience Response"** to the issue, and finally a **"Location of Correction"** directing you to the page number/section within the proposal where the corrections/edits are to be found. We believe that the proposal has been strengthened by this process.

Sincerely,



Dr. John P. Bruno
Director, Neuroscience Major
Professor of Psychology, Neuroscience, and Psychiatry

1) Issue Raised: Why an undergraduate major in Neuroscience at OSU?

- i. Neuroscience Response:** We believe than an undergraduate major in Neuroscience is long overdue at The Ohio State University. In its absence, we have become a bit of an anomaly among many universities (large & small), both in the state and across the nation. There are well over 100 colleges and universities around the nation that offer a degree (BA or BS) in Neuroscience. Nine of these programs are already in the State of Ohio (i.e. Oberlin, Kenyon, Ohio Univ., and Cincinnati). There are 5 such programs within the Big Ten Conference (i.e. Michigan, Indiana, Minnesota, Northwestern), and a dozen or more located within many of our benchmark or aspirational universities ranked within the top 25 (i.e. Johns Hopkins, Pittsburgh, Penn, Brown, Duke, Emory, Carnegie Mellon). Each year we lose many bright applicants to both in- and out-of-state competition due to our lack of this popular interdisciplinary offering.

Our lack of an undergraduate Neuroscience Major is made even more difficult to comprehend given that we have a large and very active interdisciplinary graduate program in Neuroscience (NGSP), as well as two related graduate programs in the School of Biomedical Science (Molecular, Cellular, and Developmental; Integrated Biomedical Sciences). Finally, we have a very popular Neuroscience minor and dozens of current OSU students each year are creating, de-facto, Neuroscience majors (though without the breadth or depth of the major proposed below) through a personalized studies or self-designed major program.

Given the breadth of OSU faculty scholarship and talent across the University, we should be the leader in the state and nationally in the training of undergraduate neuroscience majors. The cooperative allegiance between Arts and Sciences and the College of Medicine and Public Health, already demonstrated in the development of this curriculum, will galvanize and focus interest among the 90 or more OSU neuroscientists on this important undergraduate offering.

Location of Correction: *CAA 13 of 52*

2) Issue Raised: Add explanation of the pre-req structure for the courses in the major, as well as develop advising sheets representing a clear delineation of the requirements for each specialization within the neuroscience major. Include wording stating that the specialization will be listed on the student's transcript.

- i. Neuroscience Response:** The new advising sheets that accompany this letter have been designed to clarify the prerequisite structure and to clarify that Math 1151.01 is a prerequisite to earn the B.S. degree. Under *Major Overview*, there is a bullet indicating that Math 1151.01 is a requirement for the B.S. degree. The table, *Core Prerequisites*, identifies the necessary prerequisites for the Core. In the following table, *Core Courses*, the options in the Data Analysis section have been clarified. Advising sheets are located at the end of the cover letter

Before the table of course options for the student's chosen specialization is language indicating that the specialization will appear on the student's transcript. Jed Dickhaut in OIT already has created the coding for the major as well as for each of the specializations which will be implemented if this major is approved.

Location of Correction *CAA 29, 30 & 31 of 52; Pages 6-18 of this document*

- 3) **Issue Raised:** Is the selection of a “C” for minimum grade required for a course to count toward the major acceptable instead of a “C-“requirement.
- i. **Neuroscience Response:** The Neuroscience Major is a competitive major designed, in part, for students who aspire to medical or dental schools or graduate training in one of the many sub-disciplines of neuroscience. These are very competitive post-graduate programs. Permitting major credit for a below average grade (i.e. “C-“ is equivalent to a 1.7 GPA) will not adequately prepare a student for success in future coursework in the major, will not be conducive to a student’s competitiveness for postgraduate plans, nor will it serve the desired reputation for rigor of the program both within and outside the University.

Location of Correction *CAA 20 of 52*

- 4) **Issue Raised:** Clarify the learning goals for the major

i. **Neuroscience Response:**

1. Acquire and apply foundational knowledge from the core courses (neuroanatomy, neurophysiology, psychobiology, and cognitive neuroscience) to explain the structure and function of the brain and nervous system
2. Integrate foundational knowledge in the core disciplines to support advanced studies in (or explain problems in) specific sub-disciplines of neuroscience represented in the tracks of specialization
3. Acquire and apply statistical skills to critically evaluate data and research findings from readings in neuroscience and potential research experiences
4. Read and critically review the primary scientific literature in the neurosciences

Location of Correction *CAA 16 & 17 of 52*

5) **Issue Raised:** Update PACER table and include clarification for maximums and minimums for credit hours.

i. Neuroscience Response:

Credit Hour Explanation

| Program credit hour requirements | | A) Number of Credit hours in current program (Quarter credit hours) | B) Calculated result for 2/3rds of current (Semester credit hours) | C) Number of credit hours required for proposed program (Semester credit hours) | D) Change in credit hours |
|---|---------|---|--|---|---------------------------|
| Total minimum credit hours required for completion of program | | | | 36 | |
| Required credit hours offered by the unit | Minimum | | | 0 | |
| | Maximum | | | 0 | |
| Required credit hours offered outside of the unit | Minimum | | | 0 | |
| | Maximum | | | 0 | |
| Required prerequisite credit hours not included above | Minimum | | | 12 ^a | |
| | Maximum | | | 36 ^{b,c} | |

^a Core prerequisites: Biology 1113 (4 hours); Math 1151 (5 hours); Psychology 1100 (3hours)

^b Maximum required prerequisites for specific coursework in specializations: Molecular/Cellular= 33; Systems/Behavioral=33; Cognitive/Computational=36

^c For Cognitive/Computational specializaiton only: Assumes completion of the 12 hours of prerequisites for CSE 3521

Location of Correction CAA 1 of 52

6) **Issue Raised:** Will a curriculum committee be constituted for the major?

i. Neuroscience Response: Currently, the curriculum committee consists of Drs. Georgia Bishop (Neuroscience/College of Medicine), John Bruno (Psychology/College of Arts and Sciences), and Mitch Masters (Evolution, Ecology, and Organismal Biology/College of Biological Sciences). Each of these committee members were part of a slightly larger group responsible, over the past 1 ½ years, for designing the original curriculum of the major. Thus, they are well-versed in evaluating courses/syllabi for the rigor and content necessary for the major. We also intend to add, in the near future, an additional member with expertise in the area of cognitive neuroscience who will come from either CSE or Psychology.

Location of Correction None

- 7) **Issue Raised:** Can undergraduate students be successful in completing the 7000-level courses listed in the specialization tracks?
- i. **Neuroscience Response:** The first specialization track (Molecular/Cellular) contains a higher number of 7000-level courses than any other track. While the inclusion of these courses enriches the quality of this track, it does raise the issue of whether our undergraduates will be able to be successful in these highly specialized courses. It should be noted that advanced undergraduates, with the backgrounds that our neuroscience majors will acquire, are already successfully completing these courses. Each of the instructors of these courses has agreed that advanced, hard-working undergraduates will continue to be permitted to enroll in these courses but, that they will continue to be by permission only. It is also our intent that as the Neuroscience Major evolves; additional courses will emerge in this track that are offered at the 4000 level.
1. **Location of Correction** *None*

- 8) **Issue Raised:** Why is research not a requirement for the major, and can the supply of research experiences grow with the demand of your major?

i. **Neuroscience Response:**

Why is research not a requirement? The Neuroscience Major strongly values the experience of scholarly activities outside of the classroom as a critical complement to the learning that will occur through the various courses offered by the major. Many of our students' career and educational goals (i.e. graduate or professional schools) will necessitate involvement in laboratory-based research. For these students, research will essentially be a self-imposed requirement and, there are sufficient elective hours within the major to permit a significant, multi-term experience that could eventuate in a thesis. However, some of our majors will not go on for additional training after graduation. They will enter the workforce in various capacities and requiring research for these students would be a disservice to them and create an unnecessary burden on faculty advisors.

b) Can the supply of research experiences grow with the demand of your major? We expect to be able to accommodate all such requests. Congruent with our major's interdisciplinary nature, the program will be able to call upon approximately 90 different faculty members distributed across five departments and programs for development of student research opportunities.

Location of Correction: *None*

9) Issue Raised: Clarify mathematic requirement concisely throughout proposal.

i. Neuroscience Response:

Several changes have been made throughout the proposal document to clarify that Math 1151.01 is a GE requirement for earning the B.S. degree and that Math 1150 appears only as a possible prerequisite for the Data Analysis optional Core course, Molecular Genetics 5650. Footnote 1 on page 14 of the proposal (page 25 of the PACER document) now identifies only Math 1151.01 as a Core prerequisite. Throughout the proposal, especially those documents that students would see (e.g. the Major Program Form), Math 1151.01 is indicated as a requirement for the B.S. degree. The new advising sheets that accompany this letter provide this clarification as well.

Location of Correction *throughout CAA document*

10) Issue Raised: How will advising be administered for the major?

i. Neuroscience Response: Neuroscience majors will benefit from the expertise of both professional advisors and faculty advisors. The professional advising staff currently includes a full-time Academic & Student Services Coordinator and a part-time graduate advising associate and will be augmented as the number of majors dictates. The professional advising staff is currently housed in the Psychology Building, providing a central location for students to access academic, advising, and career services. As needed, professional advising staff will utilize faculty advisors as additional resources to which to refer students. Faculty advisors will represent a multitude of sub-disciplines in neuroscience and will primarily advise students on research and provide career guidance.

Location of Correction *None*

NEUROSCIENCE BACHELOR OF SCIENCE

Molecular/Cellular Neuroscience Specialization

Major Overview

- Thirty-six (36) semester credits in approved Neuroscience coursework.
- Majors will follow the Bachelor of Science curriculum for GE and other degree requirements. <http://ascadvising.osu.edu/>
- Math 1151.01 is a requirement for the BS degree
- Students are encouraged to focus on completion of core pre-requisite coursework and beginning core requirements for the major.
- Pre-requisite courses and core requirements should be completed by the end of the sophomore year.

CORE PREREQUISITES

| Course | Hours | Title | Course Prerequisite |
|-----------------|-------|--|---------------------|
| Biology 1113 | 4 | Biological Sciences: Energy Transfer and Development | None |
| Math 1151 | 5 | Calculus I | Math 1150 |
| Psychology 1100 | 3 | General Psychology | None |

CORE COURSES

| Course | Hours | Title | Course Prerequisite |
|---|-------|--|--|
| Neuroscience 3000 | 3 | Introduction to Neuroscience | Biology 1113 |
| Neuroscience 3050 | 3 | Structure and Function of the Nervous System | Biology 1114 OR Neurosci 3000 OR Permission of Instructor |
| Psychology 2313 | 3 | Introduction to Behavioral Neuroscience | Psych 1100 |
| Psychology 2513 | 3 | Introduction to Cognitive Neuroscience | Psych 1100 |
| Data Analysis: (Select 1 of 4 options) | | | |
| ¹ Psych 2220 | | Introduction to Data Analysis in Psychology | ¹ Psych 1100 + Math 1148 |
| ² Mol Gen 5650 | 3 | Analysis and Interpretation of Biological Data I | ² Math 1150 + 9 Hours of FAES or BIO SCI 300- level or higher |
| ³ Stats 2180 | | Statistics for the Life Sciences | ³ Math 1151.01 |
| ⁴ Stats 2450 | | Introduction to Statistical Analysis | ⁴ Math 1151.01 |

TRACK COURSES

Upon completion of the five core courses, students following the Molecular/Cellular Neuroscience specialization must take five courses in this declared track and two courses in at least one other track for additional breadth. This focal track of specialization will be transcribed on your transcript.

Molecular/Cellular Neuroscience

| Course | Hours | Title | Course Prerequisite |
|--------------------------------------|-------|----------------------------------|---|
| Psychology 2305 | 3 | Drugs & Behavior | Psych 1100 |
| Neuroscience 3010 | 3 | Neurophysiology | NeuroSci 3000 or NeuroSci 3050 or permission of instructor |
| Psychology 4501 | 3 | Advanced Behavioral Neuroscience | Psych 2313 |
| Psychology 4644 | 3 | Hormones & Behavior | Psych 2313 |
| Neuroscience 7050 | 3 | Neurobiology of Disease | Permission of instructor. |
| Molecular Virology & Immunology 7500 | 3 | Neuroimmunology | Permission of instructor. |
| Neuroscience 7001 | 3 | Foundations of Neuroscience | Permission of instructor. |
| Neuroscience 7900 | 3 | Neurodevelopment | Permission of instructor. |
| Biochem 4511 | 4 | Intro to Biological Chemistry. | (Chem 1210 or 1220) + (Chem 2510 or 2520) + 2 semesters of Bio Sci. |
| MolGen 4500 | 4 | General Genetics | Biology 1113 + 3 add'l hours in Bio Sci. |

BREADTH COURSES

Students must choose 2 courses from at least one of the other two Neuroscience specializations, Systems/Behavioral Neuroscience and Cognitive/Computational Neuroscience. Faculty advisors may approve substitution of research hours only under unusual circumstances, and when a student's research adds breadth to his/her program.

Systems/Behavioral Neuroscience

| Course | Hours | Title | Course Prerequisite |
|------------------|-------|------------------------------------|---|
| Psychology 2305 | 3 | Drugs & Behavior | Psych 1100 |
| EEOB 4007 | 3 | Neurobiology of Behavior | 2 courses in the Bio Sci |
| Psychology 4501 | 3 | Advanced Behavioral Neuroscience | Psych 2313 |
| Psychology 4644 | 3 | Hormones & Behavior | Psych 2313 |
| Psychology 4623 | 3 | Biological Clocks & Behavior | Psych 2313 or permission of instructor. |
| Psychology 5613H | 3 | Biological Psychiatry | Psych 4501 or permission of instructor. |
| Psychology 5898 | 3 | Seminar in Behavioral Neuroscience | Psych 4501 or permission of instructor. |
| Biochem 4511 | 4 | Intro to Biological Chemistry. | (Chem 1210 or 1220) + (Chem 2510 or 2520) + 2 semesters of Bio Sci. |
| MolGen 4500 | 4 | General Genetics | Biology 1113 + 3 add'l hours in Bio Sci. |

Cognitive/Computational Neuroscience

| Course | Hours | Title | Course Prerequisite |
|--|-------|--|--|
| Psychology 2310 | 3 | Sensation & Perception | Psych 1100 |
| Psychology 5600 | 3 | Psychobiology of Learning & Memory | Psych 1100 |
| Psychology 5606 | 3 | High-Level Vision | Psych 2310 |
| Psychology 5608 | 3 | Introduction Mathematical Psychology | Psych 3321 |
| Psychology 5609 | 3 | Introduction to Mathematical Models in Experimental Psychology | Psych 5608 |
| Psych 5612; CSE 5612; Ling 5612; OR Philos 5612 | 3 | Introduction to Cognitive Science | 12 credit hrs from 2 of the following areas: CIS, Linguistics, Philosophy, or Psychology |
| Psychology 5614 | 3 | Cognitive Neuroscience | Psych 2313 or 2513 or permission of instructor. |
| Psychology 5617 | 4 | Models of Memory | permission of instructor |
| CSE 5526 | 3 | Introduction to Neural Networks | CSE 3521 |
| CSE 5539 | 2 | Intermediate Studies in AI | None |
| SHS 5760 | 3 | Neurology of Speech and Hearing Mechanisms | Grad standing in SHS or permission of instructor. |

NEUROSCIENCE BACHELOR OF SCIENCE

Systems/Behavioral Neuroscience Specialization

Major Overview

- Thirty-six (36) semester credits in approved Neuroscience coursework.
- Majors will follow the Bachelor of Science curriculum for GE and other degree requirements. <http://ascadvising.osu.edu/>
- Math 1151.01 is a requirement for the BS degree
- Students are encouraged to focus on completion of core pre-requisite coursework and beginning core requirements for the major.
- Pre-requisite courses and core requirements should be completed by the end of the sophomore year.

CORE PREREQUISITES

| Course | Hours | Title | Course Prerequisite |
|-----------------|-------|--|---------------------|
| Biology 1113 | 4 | Biological Sciences: Energy Transfer and Development | None |
| Math 1151 | 5 | Calculus I | Math 1150 |
| Psychology 1100 | 3 | General Psychology | None |

CORE COURSES

| Course | Hours | Title | Course Prerequisite |
|---|-------|--|--|
| Neuroscience 3000 | 3 | Introduction to Neuroscience | Biology 1113 |
| Neuroscience 3050 | 3 | Structure and Function of the Nervous System | Biology 1114 OR Neurosci 3000 OR Permission of Instructor |
| Psychology 2313 | 3 | Introduction to Behavioral Neuroscience | Psych 1100 |
| Psychology 2513 | 3 | Introduction to Cognitive Neuroscience | Psych 1100 |
| Data Analysis: (Select 1 of 4 options) | | | |
| ¹ Psych 2220 | | Introduction to Data Analysis in Psychology | ¹ Psych 1100 + Math 1148 |
| ² Mol Gen 5650 | 3 | Analysis and Interpretation of Biological Data I | ² Math 1150 + 9 Hours of FAES or BIO SCI 300- level or higher |
| ³ Stats 2180 | | Statistics for the Life Sciences | ³ Math 1151.01 |
| ⁴ Stats 2450 | | Introduction to Statistical Analysis | ⁴ Math 1151.01 |

TRACK COURSES

Upon completion of the five core courses, students following the Systems/Behavioral Neuroscience specialization must take five courses in this declared track and two courses in at least one other track for additional breadth. This focal track of specialization will be transcribed on your transcript.

Systems/Behavioral Neuroscience

| Course | Hours | Title | Course Prerequisite |
|------------------|-------|------------------------------------|---|
| Psychology 2305 | 3 | Drugs & Behavior | Psych 1100 |
| EEOB 4007 | 3 | Neurobiology of Behavior | 2 courses in the Bio Sci |
| Psychology 4501 | 3 | Advanced Behavioral Neuroscience | Psych 2313 |
| Psychology 4644 | 3 | Hormones & Behavior | Psych 2313 |
| Psychology 4623 | 3 | Biological Clocks & Behavior | Psych 2313 or permission of instructor. |
| Psychology 5613H | 3 | Biological Psychiatry | Psych 4501 or permission of instructor. |
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| MolGen 4500 | 4 | General Genetics | Biology 1113 + 3 add'l hours in Bio Sci. |

BREADTH COURSES

Students must choose 2 courses from at least one of the other two Neuroscience specializations, Molecular/Cellular Neuroscience and Cognitive/Computational Neuroscience. Faculty advisors may approve substitution of research hours only under unusual circumstances, and when a student's research adds breadth to his/her program.

Molecular/Cellular Neuroscience

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| Psychology 2305 | 3 | Drugs & Behavior | Psych 1100 |
| Neuroscience 3010 | 3 | Neurophysiology | NeuroSci 3000 or NeuroSci 3050 or permission of instructor |
| Psychology 4501 | 3 | Advanced Behavioral Neuroscience | Psych 2313 |
| Psychology 4644 | 3 | Hormones & Behavior | Psych 2313 |
| Neuroscience 7050 | 3 | Neurobiology of Disease | Permission of instructor. |
| Molecular Virology & Immunology 7500 | 3 | Neuroimmunology | Permission of instructor. |
| Neuroscience 7001 | 3 | Foundations of Neuroscience | Permission of instructor. |
| Neuroscience 7900 | 3 | Neurodevelopment | Permission of instructor. |
| Biochem 4511 | 4 | Intro to Biological Chemistry. | (Chem 1210 or 1220) + (Chem 2510 or 2520) + 2 semesters of Bio Sci. |
| MolGen 4500 | 4 | General Genetics | Biology 1113 + 3 add'l hours in Bio Sci. |

Cognitive/Computational Neuroscience

| Course | Hours | Title | Course Prerequisite |
|--|-------|--|--|
| Psychology 2310 | 3 | Sensation & Perception | Psych 1100 |
| Psychology 5600 | 3 | Psychobiology of Learning & Memory | Psych 1100 |
| Psychology 5606 | 3 | High-Level Vision | Psych 2310 |
| Psychology 5608 | 3 | Introduction Mathematical Psychology | Psych 3321 |
| Psychology 5609 | 3 | Introduction to Mathematical Models in Experimental Psychology | Psych 5608 |
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| Psychology 5614 | 3 | Cognitive Neuroscience | Psych 2313 or 2513 or permission of instructor. |
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| CSE 5526 | 3 | Introduction to Neural Networks | CSE 3521 |
| CSE 5539 | 2 | Intermediate Studies in AI | None |
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NEUROSCIENCE BACHELOR OF SCIENCE

Cognitive/Computational Neuroscience Specialization

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-

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| ² Mol Gen 5650 | 3 | Analysis and Interpretation of Biological Data I | ² Math 1150 + 9 Hours of FAES or BIO SCI 300- level or higher |
| ³ Stats 2180 | | Statistics for the Life Sciences | ³ Math 1151.01 |
| ⁴ Stats 2450 | | Introduction to Statistical Analysis | ⁴ Math 1151.01 |

TRACK COURSES

Upon completion of the five core courses, students following the Cognitive/Computational Neuroscience specialization must take five courses in this declared track and two courses in at least one other track for additional breadth. This focal track of specialization will be transcribed on your transcript.

Cognitive/Computational Neuroscience

| Course | Hours | Title | Course Prerequisite |
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| Psychology 5617 | 4 | Models of Memory | permission of instructor |
| CSE 5526 | 3 | Introduction to Neural Networks | CSE 3521 |
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Molecular/Cellular Neuroscience

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| Psychology 4644 | 3 | Hormones & Behavior | Psych 2313 |
| Neuroscience 7050 | 3 | Neurobiology of Disease | Permission of instructor. |
| Molecular V&I 7500 | 3 | Neuroimmunology | Permission of instructor. |
| Neuroscience 7001 | 3 | Foundations of Neuroscience | Permission of instructor. |
| Neuroscience 7900 | 3 | Neurodevelopment | Permission of instructor. |
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Systems/Behavioral Neuroscience

| Course | Hours | Title | Course Prerequisite |
|------------------|-------|------------------------------------|---|
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| EEOB 4007 | 3 | Neurobiology of Behavior | 2 courses in the Bio Sci |
| Psychology 4501 | 3 | Advanced Behavioral Neuroscience | Psych 2313 |
| Psychology 4644 | 3 | Hormones & Behavior | Psych 2313 |
| Psychology 4623 | 3 | Biological Clocks & Behavior | Psych 2313 or permission of instructor. |
| Psychology 5613H | 3 | Biological Psychiatry | Psych 4501 or permission of instructor. |
| Psychology 5898 | 3 | Seminar in Behavioral Neuroscience | Psych 4501 or permission of instructor. |
| Biochem 4511 | 4 | Intro to Biological Chemistry. | (Chem 1210 or 1220) + (Chem 2510 or 2520) + 2 semesters of Bio Sci. |
| MolGen 4500 | 4 | General Genetics | Biology 1113 + 3 add'l hours in Bio Sci. |

Status: PENDING

PROGRAM REQUEST
ASC & COM/Neuroscience

Last Updated: Gustafson, Terry Lee
05/27/2011

Fiscal Unit/Academic Org Social & Behavioral Sci Admin - D0700
Administering College/Academic Group Arts And Sciences
Co-administering College/Academic Group The College of Medicine
Semester Conversion Designation New Program/Plan
Proposed Program/Plan Name ASC & COM/Neuroscience
Type of Program/Plan Undergraduate bachelors degree program or major
Program/Plan Code Abbreviation NEUROSC
Proposed Degree Title Neuroscience

Credit Hour Explanation

| Program credit hour requirements | | A) Number of credit hours in current program (Quarter credit hours) | B) Calculated result for 2/3rds of current (Semester credit hours) | C) Number of credit hours required for proposed program (Semester credit hours) | D) Change in credit hours |
|---|---------|---|--|---|---------------------------|
| Total minimum credit hours required for completion of program | | | | 36 | |
| Required credit hours offered by the unit | Minimum | | | 0 | |
| | Maximum | | | 0 | |
| Required credit hours offered outside of the unit | Minimum | | | 0 | |
| | Maximum | | | 0 | |
| Required prerequisite credit hours not included above | Minimum | | | 12 | |
| | Maximum | | | 33 | |

Program Learning Goals

Note: these are required for all undergraduate degree programs and majors now, and will be required for all graduate and professional degree programs in 2012. Nonetheless, all programs are encouraged to complete these now.

Program Learning Goals

- 1. Students acquire a strong foundational background in core disciplines of neuroscience.
- 2. Students acquire statistical skills.
- 3. Students acquire advanced knowledge of molecular/cellular neuroscience, systems/behavioral neuroscience, or cognitive/computational neuroscience.
- 4. Students engage in critical reading of the primary scientific lit in advanced courses

Assessment

Assessment plan includes student learning goals, how those goals are evaluated, and how the information collected is used to improve student learning. An assessment plan is required for undergraduate majors and degrees. Graduate and professional degree programs are encouraged to complete this now, but will not be required to do so until 2012.

Is this a degree program (undergraduate, graduate, or professional) or major proposal? Yes

Does the degree program or major have an assessment plan on file with the university Office of Academic Affairs? No

DIRECT MEASURES (means of assessment that measure performance directly, are authentic and minimize mitigating or intervening factors)

Classroom assignments

- Embedded testing (i.e. specific questions in homework or exams that allow faculty to assess students' attainments of a specific learning goal)
- Other classroom assessment methods (e.g., writing assignments, oral presentations, oral exams)

INDIRECT MEASURES (means of assessment that are related to direct measures but are steps removed from those measures)

Surveys and Interviews

- Student survey
- Student interviews or focus groups

Additional types of indirect evidence

- Job or post-baccalaureate education placement

USE OF DATA (how the program uses or will use the evaluation data to make evidence-based improvements to the program periodically)

- Analyze and report to college/school
- Make improvements in curricular requirements (e.g., add, subtract courses)
- Make improvements in course content
- Make improvements in course delivery and learning activities within courses
- Periodically confirm that current curriculum and courses are facilitating student attainment of program goals
- Other: Analyze and report to program oversight committee

Program Specializations/Sub-Plans

If you do not specify a program specialization/sub-plan it will be assumed you are submitting this program for all program specializations/sub-plans.

Pre-Major

Does this Program have a Pre-Major? No

Attachments

- Steinmetz Lucey Letters of Support.pdf: Letters of Support from Deans of COM & ASC
(Letter from the College to OAA. Owner: Haddad, Deborah Moore)
- CCI Subcommittee Chair Letter Neuroscience.doc: CCI Subcommittee Chair Letter
(Other Supporting Documentation. Owner: Vankeerbergen, Bernadette Chantal)
- Neuroscience Major Proposal.pdf: Major Program Proposal
(Program Proposal. Owner: Haddad, Deborah Moore)
- Neurosci Learning Goals Map.pdf: Learning Goals Map
(Curricular Map(s). Owner: Haddad, Deborah Moore)
- final.pdf: Final document for OAA
(Other Supporting Documentation. Owner: Vankeerbergen, Bernadette Chantal)
- ASC-final.pdf: Final Document + ASC Cover Letter
(Other Supporting Documentation. Owner: Gustafson, Terry Lee)

Comments

Status: PENDING

PROGRAM REQUEST
ASC & COM/Neuroscience

Last Updated: Gustafson, Terry Lee
05/27/2011

Workflow Information

| Status | User(s) | Date/Time | Step |
|--------------------|---|---------------------|------------------------|
| Submitted | Haddad, Deborah Moore | 03/06/2011 07:19 PM | Submitted for Approval |
| Approved | Davidson, John Ellsworth | 04/15/2011 12:14 PM | Unit Approval |
| Revision Requested | Williams, Valarie Lucille | 04/18/2011 09:57 AM | College Approval |
| Submitted | Haddad, Deborah Moore | 04/21/2011 01:06 PM | Submitted for Approval |
| Approved | Young, Seth B | 04/21/2011 03:43 PM | Unit Approval |
| Approved | Mumy, Gene Elwood | 04/22/2011 02:43 PM | College Approval |
| Revision Requested | Vankeerbergen, Bernadette Chantal | 05/13/2011 03:51 PM | ASCCAO Approval |
| Submitted | Haddad, Deborah Moore | 05/16/2011 02:30 PM | Submitted for Approval |
| Approved | Benzakein, Meyer Jacques | 05/16/2011 04:07 PM | Unit Approval |
| Approved | Mumy, Gene Elwood | 05/16/2011 08:47 PM | College Approval |
| Revision Requested | Vankeerbergen, Bernadette Chantal | 05/17/2011 09:03 AM | ASCCAO Approval |
| Submitted | Haddad, Deborah Moore | 05/17/2011 09:13 AM | Submitted for Approval |
| Approved | Mumy, Gene Elwood | 05/17/2011 09:38 AM | Unit Approval |
| Approved | Vanarsdale, Sonya Renee | 05/17/2011 10:28 AM | College Approval |
| Revision Requested | Vankeerbergen, Bernadette Chantal | 05/17/2011 04:00 PM | ASCCAO Approval |
| Submitted | Haddad, Deborah Moore | 05/17/2011 04:16 PM | Submitted for Approval |
| Approved | Mumy, Gene Elwood | 05/17/2011 04:27 PM | Unit Approval |
| Approved | Vanarsdale, Sonya Renee | 05/18/2011 09:54 AM | College Approval |
| Revision Requested | Vankeerbergen, Bernadette Chantal | 05/19/2011 09:15 AM | ASCCAO Approval |
| Submitted | Haddad, Deborah Moore | 05/19/2011 09:53 AM | Submitted for Approval |
| Approved | Vanarsdale, Sonya Renee | 05/19/2011 09:54 AM | Unit Approval |
| Approved | Vanarsdale, Sonya Renee | 05/19/2011 10:30 AM | College Approval |
| Approved | Vankeerbergen, Bernadette Chantal | 05/19/2011 03:15 PM | ASCCAO Approval |
| Approved | Gustafson, Terry Lee | 05/27/2011 03:09 PM | ASC Approval |
| Pending Approval | Soave, Melissa A Cameron, Erin Marie | 05/27/2011 03:09 PM | CAA Approval |



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artsandsciences.osu.edu

May 27, 2011

To: W. Randy Smith, Vice Provost, Office of Academic Affairs
 From: Terry L. Gustafson, Special Assistant to the Executive Dean for Semester Conversion
Terry L. Gustafson
 Re: Arts and Sciences Program Proposals from the Social and Behavioral Sciences Division

Arts and Sciences is pleased to submit the following programs from the Social and Behavioral Sciences Division to the Office of Academic Affairs for conversion from quarters to semesters. The programs have been approved by the faculty members and chair of the originating unit, and reviewed and approved by the divisional advisory panel, a subcommittee of the ASC Committee on Curriculum and Instruction (CCI), and the full CCI. The vote for approval of all programs at the full CCI was unanimous.

| Program Name | Academic Plan Code | Conversion Designation | CCI Approval | Last Revision |
|-----------------------------|--------------------|------------------------|--------------|---------------|
| Forensic Science Minor | FORSCI-MN | Converted | 5/2/2011 | Prior to 2006 |
| International Studies BA | INTSTD-BA | Re-envisioned | 5/6/2011 | 2/17/2010 |
| Globalization Studies BA | GLOBLST-BA | Re-envisioned | 5/6/2011 | 1/21/2009 |
| Globalization Studies Minor | GLOBLST-MN | Re-envisioned | 5/20/2011 | 2/17/2010 |
| Neuroscience BS | NEUROSC-BS | New | 5/19/2011 | N/A |

Arts and Sciences General Education (GE) Program: The GE program for untagged B.A. and B.S. degrees in Arts and Sciences was approved by the Council on Academic Affairs on May 26, 2010, after receiving approval from the Arts and Sciences Faculty Senate. All the programs presented here follow the approved GE program.

College of Arts and Sciences Transition Policy: The College of Arts and Sciences is committed to the principles outlined in the university's Pledge to Undergraduate Students. Each unit has a plan on how best to assist its majors and minors through the transition. And the Arts and Sciences Academic Advising Services will advise students on how to transition their GE program. Dual advising is the existing process used in Arts and Sciences and will continue under semesters.

Status: PENDING

PROGRAM REQUEST
ASC & COM/Neuroscience

Last Updated: Vanarsdale, Sonya Renee
05/19/2011

Fiscal Unit/Academic Org Social & Behavioral Sci Admin - D0700
Administering College/Academic Group Arts And Sciences
Co-administering College/Academic Group The College of Medicine
Semester Conversion Designation New Program/Plan
Proposed Program/Plan Name ASC & COM/Neuroscience
Type of Program/Plan Undergraduate bachelors degree program or major
Program/Plan Code Abbreviation
Proposed Degree Title Neuroscience

Credit Hour Explanation

| Program credit hour requirements | | A) Number of credit hours in current program (Quarter credit hours) | B) Calculated result for 2/3rds of current (Semester credit hours) | C) Number of credit hours required for proposed program (Semester credit hours) | D) Change in credit hours |
|---|---------|---|--|---|---------------------------|
| Total minimum credit hours required for completion of program | | | | 36 | |
| Required credit hours offered by the unit | Minimum | | | 0 | |
| | Maximum | | | 0 | |
| Required credit hours offered outside of the unit | Minimum | | | 0 | |
| | Maximum | | | 0 | |
| Required prerequisite credit hours not included above | Minimum | | | 12 | |
| | Maximum | | | 33 | |

Program Learning Goals

Note: these are required for all undergraduate degree programs and majors now, and will be required for all graduate and professional degree programs in 2012. Nonetheless, all programs are encouraged to complete these now.

Program Learning Goals

- 1. Students acquire a strong foundational background in core disciplines of neuroscience.
- 2. Students acquire statistical skills.
- 3. Students acquire advanced knowledge of molecular/cellular neuroscience, systems/behavioral neuroscience, or cognitive/computational neuroscience.
- 4. Students engage in critical reading of the primary scientific lit in advanced courses

Assessment

Assessment plan includes student learning goals, how those goals are evaluated, and how the information collected is used to improve student learning. An assessment plan is required for undergraduate majors and degrees. Graduate and professional degree programs are encouraged to complete this now, but will not be required to do so until 2012.

Is this a degree program (undergraduate, graduate, or professional) or major proposal? Yes

Does the degree program or major have an assessment plan on file with the university Office of Academic Affairs? No

DIRECT MEASURES (means of assessment that measure performance directly, are authentic and minimize mitigating or intervening factors)

Classroom assignments

- Embedded testing (i.e. specific questions in homework or exams that allow faculty to assess students' attainments of a specific learning goal)
- Other classroom assessment methods (e.g., writing assignments, oral presentations, oral exams)

INDIRECT MEASURES (means of assessment that are related to direct measures but are steps removed from those measures)

Surveys and Interviews

- Student survey
- Student interviews or focus groups

Additional types of indirect evidence

- Job or post-baccalaureate education placement

USE OF DATA (how the program uses or will use the evaluation data to make evidence-based improvements to the program periodically)

- Analyze and report to college/school
- Make improvements in curricular requirements (e.g., add, subtract courses)
- Make improvements in course content
- Make improvements in course delivery and learning activities within courses
- Periodically confirm that current curriculum and courses are facilitating student attainment of program goals
- Other: Analyze and report to program oversight committee

Program Specializations/Sub-Plans

If you do not specify a program specialization/sub-plan it will be assumed you are submitting this program for all program specializations/sub-plans.

Pre-Major

Does this Program have a Pre-Major? No

Attachments

- Steinmetz Lucey Letters of Support.pdf: Letters of Support from Deans of COM & ASC
(Letter from the College to OAA. Owner: Haddad, Deborah Moore)
- CCI Subcommittee Chair Letter Neuroscience.doc: CCI Subcommittee Chair Letter
(Other Supporting Documentation. Owner: Vankeerbergen, Bernadette Chantal)
- Neuroscience Major Proposal.pdf: Major Program Proposal
(Program Proposal. Owner: Haddad, Deborah Moore)
- Neurosci Learning Goals Map.pdf: Learning Goals Map
(Curricular Map(s). Owner: Haddad, Deborah Moore)

Comments

Status: PENDING

PROGRAM REQUEST
ASC & COM/Neuroscience

Last Updated: Vanarsdale, Sonya Renee
05/19/2011

Workflow Information

| Status | User(s) | Date/Time | Step |
|--------------------|---|---------------------|------------------------|
| Submitted | Haddad, Deborah Moore | 03/06/2011 07:19 PM | Submitted for Approval |
| Approved | Davidson, John Ellsworth | 04/15/2011 12:14 PM | Unit Approval |
| Revision Requested | Williams, Valarie Lucille | 04/18/2011 09:57 AM | College Approval |
| Submitted | Haddad, Deborah Moore | 04/21/2011 01:06 PM | Submitted for Approval |
| Approved | Young, Seth B | 04/21/2011 03:43 PM | Unit Approval |
| Approved | Mumy, Gene Elwood | 04/22/2011 02:43 PM | College Approval |
| Revision Requested | Vankeerbergen, Bernadette Chantal | 05/13/2011 03:51 PM | ASCCAO Approval |
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| Approved | Vanarsdale, Sonya Renee | 05/19/2011 10:30 AM | College Approval |
| Pending Approval | Hanlin, Deborah Kay Vankeerbergen, Bernadette Chantal Meyers, Catherine Anne Jenkins, Mary Ellen Bigler Nolen, Dawn | 05/19/2011 10:30 AM | ASCCAO Approval |

To: Larry Krissek, Chair, Committee on Curriculum and Instruction (CCI)
From: James Fredal, Chair, CCI Social, Behavioral, Biological, Mathematical and Physical Sciences Subcommittee
Re: Neuroscience BS Degree

Date: May 10, 2011

Larry:

The Sciences subcommittee of the CCI met to review a proposal for a new BS in Neuroscience during their meeting of April 4, 2011. The proposal was approved with a number of contingencies that have now been addressed.

OSU is well situated to offer a strong program in this rapidly developing field, drawing upon expertise from the Departments of Psychology, Oral Biology, EEOB, Neuroscience, and affiliated Neuroscience Signature programs in the College of Medicine. All of OSU's aspirational peers and all other Big Ten schools have undergraduate degrees in Neuroscience (including Neurobiology and Behavioral Neuroscience). The Neuroscience minor has grown steadily since its initial offering in 2005, and the major is expected to draw 35-60 new students each year for the first four years and to exceed 100 within the first 2-3 years.

This will be an interdisciplinary program drawing faculty from the Departments of Neuroscience (College of Medicine), EEOB (Biological Sciences) and Psychology (Social and Behavioral Sciences) and planned to begin with the 2012-2013 academic year. Oversight of the major will fall to the Dean of Social and Behavioral Sciences and will be administratively housed within Psychology. The SBS Dean will appoint a director, who will then appoint a steering committee made up of faculty from COM and ASC. Major advisors will be housed in Neuroscience, EEOB, and Psychology

The major will consist of 12 hours of core prerequisites, 15 hours of core courses, and 21 hours of three possible specializations (or tracks): Molecular/Cellular; Systems/ Behavioral; and Cognitive/Computational (further prerequisite courses may be required depending on the specialization courses chosen).

The committee requested a few corrections, which have been made, and also posed a few questions which were answered by Deborah Haddad, SBS Assistant Dean of Undergraduate Affairs.

The first question concerned the inclusion of a number of 7000 level courses in Molecular Virology and Immunology and in Neuroscience. Dr Haddad noted that this track/specialization can be completed without those courses, and that instructors of the courses have indicated that the strong core of of the proposed major would indeed prepare students well for the advanced work required in those courses.

The second question had to do with research hours. While the proposal emphasizes student research, the committee was unclear about where or how this research would be accomplished as undergrad research hours (4998). As Dr. Haddad noted, the proposal does indicate that students may (with approval of an advisor) substitute research hours for one of their "breadth" requirements (outside their chose specialization) and that students may also take additional research hours as a portion of their non-major electives. The proposal suggests that students will be encouraged to take advantage of these options.

Upon further review, the PACER numbers may need one additional correction: It seems the minimum number of required hours offered by the unit is 6 (not 12) and that the maximum number of hours outside the unit is 30 (not 24). This might be double checked before the proposal moves forward.

The proposal in other ways now appears complete and accurate and so we advance it to the full CCI with a recommendation for its approval.

Thank you.

Jim Fredal



Office of the Executive Dean

Arts and Sciences
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February 18, 2011

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Council on Academic Affairs
c/o Office of Academic Affairs
203 Bricker Hall
190 North Oval Mall
CAMPUS

Dear Council on Academic Affairs Members:

I am pleased to submit for your review a proposal for the Bachelor of Science degree in neuroscience. The strength of this interdisciplinary undergraduate program is evident in the collaboration of faculty across many colleges and departments and in the cohesiveness of the program's breadth and depth requirements. Moreover, the high academic standards that have contributed to the success of the existing undergraduate minor program in neuroscience and the Neuroscience Graduate Studies Program informed the development of this proposed undergraduate major.

As is noted in the proposal, there is student demand for this program at Ohio State and graduates of the program will be well-equipped to enter the workforce in many areas of public health. An important impetus in the development of the curriculum, however, has been to provide the kinds of coursework and research opportunities that students need in order to be competitive for graduate and medical schools.

This university has the capacity to offer one of the best undergraduate neuroscience programs in the country. Approximately 80 faculty from the colleges of Arts and Sciences, Dentistry, Engineering, and Medicine are on the front lines of research in virtually every area of the neurosciences, enriching the quality of classroom instruction. Many of their state-of-the-art research facilities already provide excellent research opportunities for undergraduate students. The collaborative leadership of the College of Medicine and the College of Arts and Sciences ensures that the proposed Neuroscience program begins from a strong foundation and will continue to provide cutting-edge education in the future.

The strong academic requirements of this program, combined with the broad interdisciplinary activity of the contributing faculty, make this major proposal a unique and necessary addition to our curriculum. We appreciate your consideration of the proposal, which I very strongly endorse.

Sincerely,

A handwritten signature in black ink that reads 'Joseph E. Steinmetz'.

Joseph E. Steinmetz, Ph.D.
Executive Dean and Vice Provost
Professor of Psychology and Neuroscience



Office of the Dean
College of Medicine

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February 28, 2011

Council on Academic Affairs
c/o Office of Academic Affairs
203 Bricker Hall
190 N. Oval Mall
CAMPUS

Dear Council on Academic Affairs Members:

The College of Medicine is an enthusiastic supporter of proposal of the Neuroscience Development Committee to create a new interdisciplinary undergraduate Neurosciences major leading to a B.S. degree.

Over the past decade, there has been an explosion in our understanding of the structure and function of the brain and nervous system, the result of the application of modern research techniques to complex questions. Branches of neuroscience focus on cognition, behavior, linguistics, development, cellular structure, molecular function, imaging, informatics and engineering. Faculty within the COM and the College of Arts and Sciences participate in research and education in all these areas of focus for neuroscience. In 2005, the College of Medicine targeted Neurosciences for strategic investment as a Signature Program. This has led to the recruitment of an expert in neuromodulation (deep brain stimulation), further advances in neuroimaging through the Wright Center for Innovation, and enhanced post doctoral programs in neuroscience. Across the country, universities have recognized the importance of integrating scientific expertise to advance discovery. Sustaining the advances in this field will require an increase in the pipeline of scientists with training in neuroscience. Many institutions of higher education already offer an undergraduate program in neurosciences, as evidenced by the observation that 25% of students entering the College of Medicine in 2010 listed neuroscience as their major.

This major will capitalize on and leverage the strength of our faculty and academic programs. Faculty from the Department of Neuroscience (College of Medicine), Department of Evolution, Ecology and Organismal Biology (College of Biologic Sciences) and the Department of Psychology (College of Arts and Sciences) have a track record of collaborative research and education, as evidence by the increasingly competitive and well subscribed interdisciplinary graduate program in Neuroscience and the undergraduate subspecialization in behavioral neuroscience.

The proposal put forth by the Neuroscience Development Committee is comprehensive and well constructed. We agree with Joseph Steinmetz PhD, Executive Dean of the College of Arts and Sciences, that the oversight of the program should reside in the College of Arts and Sciences with the Dean of Social and Behavioral Sciences, advised by an interdisciplinary oversight committee. The College of Medicine will support the participation of Neuroscience faculty for coursework, advising and mentoring in the classroom and with research experiences.

We congratulate the Committee for their work in constructing what we believe will be an extremely important and sought-after major. Please let me know if there is additional information you require from me to further endorse this important initiative.

Sincerely,

A handwritten signature in black ink, appearing to read "Catherine R. Lucey". The signature is fluid and cursive, with a large, sweeping flourish at the end.

Catherine R. Lucey, MD FACP
Interim Dean and Vice Dean for Education
The Ohio State University College of Medicine

CRL/pd

Proposal for a Neuroscience Major

Neuroscience Development Committee

**Drs. Georgia Bishop, R. Thomas Boyd, John Bruno, James King, Mitch Masters
and Randy Nelson**

1. General Information

This proposal is to establish a new interdisciplinary major in Neuroscience. The committee responsible for developing this major consisted of faculty from the Department of Neuroscience, College of Medicine (COM; Drs. Georgia Bishop, James King, R. Thomas Boyd, Randy Nelson); Department of Evolution, Ecology, and Organismal Biology, College of Arts and Sciences (Dr. Mitch Masters); and the Department of Psychology, College of Arts and Sciences (Dr. John Bruno). The goal is to provide undergraduates at The Ohio State University the opportunity to pursue an integrated course of study in Neuroscience. Although the university offers recognized graduate programs in Neuroscience and a Behavioral Neuroscience sub-specialization in Psychology, there is not a formally organized degree-granting program at the undergraduate level. For students interested in this area, this major provides a coherent framework for the courses and undergraduate research opportunities that exist within multiple departments and colleges. We request implementation of this major starting with the 2012/2013 academic year. Upon completion of the major, students will receive a Bachelor of Science degree.

The Neuroscience major, relying on coursework presently offered by faculty in the College of Arts and Sciences (ASC) and the College of Medicine (COM), will be administered by ASC. Oversight of this major will be assigned to one of the divisional deans in ASC. That dean will appoint and chair an Oversight Committee tasked with providing forward-looking stewardship of the major and its integrity and success.

Because the bulk of the faculty most centrally involved in the development of coursework for the Neuroscience major are in the Department of Psychology, the Executive Dean of the College of Arts and Sciences has assigned oversight responsibilities to the Dean of Social and Behavioral Sciences (SBS). Moreover, the major will be administratively housed within Psychology; ASC hopes to leverage and, over time, add to the existing advising and ASC IT operations in support of the Neuroscience major. We note that this administrative/advising arrangement has worked out quite well at two of our Big 10 peer institutions (University of Michigan and Indiana University). To handle the substantive and day-to-day aspects of the major, a director will be

appointed by the SBS Dean, and a steering committee of faculty across ASC and COM will be appointed by the director. Finally, major faculty advisors will be housed in Psychology (ASC), EEOB (ASC), and Neuroscience (COM) as well as a graduate student (Behavioral Neuroscience or Neuroscience areas) who will be located in the Psychology Department and be available 20 hr/week. The Director, Oversight Committee, and advisors will keep close track of the major counts and other relevant issues (i.e. sufficient frequency of course offerings, particularly core courses). If, for example, it appears that the advising process is being taxed by increases in the number of majors, then the Dean of SBS will present a proposal to the Oversight Committee that additional staff be hired.

2. Rationale

Neuroscience, at its most basic levels, involves the study of the brain, its development, how it processes information, how it regulates behavior, and what goes wrong during disease. Ohio State has had a rich history of research in these areas, starting with the development of a free-standing Brain Research Center in 1956. Staffing of the Center reflected the multidisciplinary nature of the field and has included researchers from neuropsychiatry, neurophysiology, neuroanatomy, neurochemistry, and psychobiology and behavioral neuroscience. The Department of Neuroscience in the College of Medicine and Public Health was established in 1998 and is a major contributor to the university-wide graduate program in Neuroscience. In addition to 23-tenured faculty, the Department of Neuroscience is comprised of many faculty with joint appointments across departments in the colleges of Arts and Sciences, Dentistry, Engineering, and Medicine. The interdisciplinary Neuroscience Graduate Studies Program (NGSP) now has ~70 faculty members, many of whom have modern, state-of-the-art research opportunities for undergraduates at Ohio State. The resources of active Neuroscience researchers will make this major very appealing to students interested in fundamental research (see Appendix C for a listing of university-wide neuroscientists with actual or potential contributions to the Neuroscience major).

The areas of Behavioral Neuroscience and Cognitive Psychology are among the premier research subdisciplinary areas within the Department of Psychology. These Psychology faculty are joined by peers with active research programs in the Department of Oral Biology (College of Dentistry with focuses on sensory and neuroimmunology), EEOB (with focuses on behavioral neuroscience), Neuroscience and the associated Neuroscience Signature Programs in the College of Medicine, and Nationwide Children's Hospital, all of which have interests in

developing this major. We suspect that the establishment of an imaging center (fMRI)¹ in Psychology will drive major interest among undergraduates in social neuroscience, auditory and speech neuroscience, economic neuroscience, and neuroethics. The development of the major is a natural outgrowth of the interdisciplinary nature of the field of Neuroscience and reflects cooperation at its best. We see this major as an opportunity to develop excellent students for our own PhD programs as well as seed other PhD programs throughout the country. This major will also serve as an important pre- health professional major.

The field of Neuroscience is an exciting and burgeoning field. The annual meeting of the Society for Neuroscience now regularly attracts ~40,000 attendees, with an increasingly strong emphasis on undergraduate neuroscience research and education. Undergraduates regularly matriculate into college with the hope of studying neuroscience. According to admissions staff at Ohio State Medical Center, the fourth most common major for accepted medical students is now neuroscience (this despite the fact that OSU has no major in this area). All of the other Big 10 schools have an undergraduate neuroscience major (except Purdue which has a Behavioral Neuroscience major). All of our aspirational schools have an undergraduate neuroscience major (called neurobiology at UCLA). In Ohio, a number of state universities (including Kent State, Bowling Green, and the University of Cincinnati), as well as private colleges (including Baldwin-Wallace, Oberlin, Hiram, Kenyon, and Muskingum Colleges), and private universities (including Ohio Wesleyan and Case Western University) offer neuroscience majors. At Ohio University, the Department of Biological Sciences offers a BS degree in Biology with an emphasis in Neuroscience and the Honors Tutorial College offers a BS degree in Neuroscience. We fear that Ohio State University is losing some of the best and brightest of Ohio college applicants because of the lack of a neuroscience major at Ohio State.

3. Goals/Objectives and Evaluation of Program

The ongoing assessment plan for the Neuroscience major will focus on the following three fundamental questions: (1) What do we want our students to know and be able to do, and what

¹ fMRI (functional magnetic resonance imaging) is a technique to image brain activity related to a specific task or sensory process: 1) the signal does not require injections of radioactive isotopes, 2) the total scan time required can be very short, i.e., on the order of 1.5 to 2.0 min per run (depending on the paradigm), and 3) the in-plane resolution of the functional image is generally about 1.5 x 1.5 mm although resolutions less than 1 mm are possible. To put these advantages in perspective, functional images obtained by the earlier method of positron emission tomography, PET, require injections of radioactive isotopes, multiple acquisitions, and, therefore, extended imaging times. Further, the expected resolution of PET images is much larger than the usual fMRI pixel size

perspectives should they acquire? (2) What evidence do we have that Neuroscience majors are acquiring the intended knowledge, skills, and perspectives? (3) How is this evidence used for ongoing improvements in student learning? More specifically, our assessment plan includes the following:

a) Learning Goals:

1. Students in the Neuroscience major acquire a strong foundational background in core disciplines of the interdisciplinary field of neuroscience. As a result, majors will enter their advanced coursework with a solid understanding of
 - the cellular specialization of neurons and non-neuronal cells of the nervous system;
 - electrical/chemical components of synaptic transmission;
 - non-synaptic intercellular transmission;
 - structure/function of the nervous system;
 - behavior and cognition as functional outputs of coordinated, distributed neuronal function.
2. Students acquire statistical skills in order to understand and critically evaluate readings to which they are exposed during later stages of the major as well as in their post-graduate training. Such skills will also enhance their own undergraduate research experiences – such research, though not required, will be *highly* recommended by advisors and faculty in the program.
3. As students' progress through the major, they acquire in-depth knowledge within a subarea of neuroscience by declaring a 'specialization track' and pursuing a series of courses focusing on a specific discipline.
 - Students acquire advanced information in the areas of molecular/cellular neuroscience, systems/behavioral neuroscience, or cognitive/computational neuroscience.
4. Students engage in critical reading of the primary scientific literature (i.e., journal articles) in several of their advanced courses.

b) Evidence of Acquisition of Learning Goals: The Neuroscience Major Development Committee (identified above) has evaluated the syllabi of each of the courses associated with the major with respect to the consistency of course material with the learning goals identified above.

1. Traditional evaluative methods (quizzes, exams, papers), used in each course will provide valuable assessment as to whether our majors are indeed acquiring the stated learning goals. The material in this major is inherently inter-related and progressive (as indicated by the prerequisite structure of many of the courses) such that, the information presented in the cores is necessary for the early courses of the specialization tracks and subsequently the information in these early courses is essential for success in the advanced courses of the specialization tracks.
2. Group performance at nodes 2 and 3 of progression through the major will provide important feedback as to whether our students are acquiring the essential learning outcomes that we expect.
 - Test questions will be embedded at nodes 2 and 3. Each year, the advising unit will collect information about student performance at these two nodes of the major. The Director and the Steering Committee will evaluate students' performance on these questions to determine if our majors are acquiring the intended learning goals.
3. Focus groups with students at various levels of the major every other year will provide further evidence of student learning. While there will be some discussion of students' satisfaction with the major (important for a new major), the principal focus during these meetings, particularly during the early years, will be on identifying skill/knowledge sets that are not being adequately addressed by our coursework.

c) Assessment of Students Graduating in the Major: We anticipate using five methods (three indirect and two direct) to assess whether students who graduate with a degree in Neuroscience have met our learning goals.

1. We will administer an exit survey to all graduating students.
2. We will conduct focus groups.
3. Since we expect that the majority of students who will select this major aspire to post-graduate training in professional schools (e.g. medicine, dental, nursing, physical therapy) or advanced research degrees in the field of neuroscience, we will use post-graduate placement as a measure of whether students are acquiring the desired knowledge and experience that render them attractive for admission into post-graduate training programs.
4. We will evaluate performance on quizzes, exams, and papers.
5. We will evaluate performance on embedded test questions at nodes 2 and 3.

4. Relationship to Other Programs / Benchmarking

There is currently an interdisciplinary minor in Neuroscience at Ohio State that has been in existence for several years. Over this time there has been rapid growth in the number of students seeking this minor (70 Neuroscience minors in SP10). There are also a large number of students in Psychology who have opted to develop Personalized Study Plans (PSPs) that essentially encompass a Neuroscience major. The Psychology major is currently the closest discipline to a Neuroscience major at Ohio State. However the Psychology major is broad and covers many aspects of psychology including social, developmental, clinical, cognitive, behavioral and several others. The Neuroscience major will have a distinct and different focus.

Although students majoring in Neuroscience will take some Psychology courses, the Neuroscience major will be unique and focus on the brain, its development, how it processes information, and its impact on behavior. Other foundational areas of Neuroscience include neurophysiology, neuroanatomy, neurochemistry, neuroimmunology, and molecular and cellular neuroscience. In contrast to many Psychology majors pursuing a B.A., students in the Neuroscience major will also be expected to acquire a strong background in chemistry, math, and physics. We anticipate that many of our Neuroscience majors will move on to professional schools (medical, dental, etc.) as well as to graduate programs in neuroscience.

Neuroscience is an important and rapidly growing field. Many of the top universities against which Ohio State benchmarks itself have majors in Neuroscience including Johns Hopkins, University of Pittsburgh, Michigan, and the University of California, San Diego. Several schools in Ohio have Neuroscience majors including Case Western, Cincinnati and Oberlin. We feel that it is important for Ohio State to have a strong Neuroscience major in order to compete for students with these top schools. Some students who would prefer a neuroscience major are most likely attending other universities rather than Ohio State because of our lack of the major. Students who will be attracted to this major will tend to be very strong academically. The vast majority of them will aspire to post-graduate training in either health-related professional schools (medical, dental, nursing) or Ph.D. programs in various neuroscience disciplines. We maintain that as the major matures it will become one of the best programs in the nation for several reasons. First, the partnership between ASC and COM, as well as the physical integration of the medical school and the central campus, will facilitate an effective partnership for our undergraduates. Second, the quantity, quality, and breadth of expertise represented by our neuroscience faculty will ultimately provide our majors with a large number of courses taught by scientists who are at the front lines of research in this field. Finally, Ohio State has developed a culture of undergraduate research and our Neuroscience majors will have the opportunity to work with internationally-renowned scientists in some of the most contemporary research facilities in the nation.

We expect that a new Neuroscience major will draw some first-year students and early sophomores from Psychology, Biological Sciences, and other students who are pursuing pre-med programs at OSU during the first year, perhaps two. These will be students interested in neuroscience who had not known that the major was available at OSU when they matriculated. Moreover, with the introduction of the major, the dozen-to- twenty students who typically enroll in effective neuroscience PSPs will be able to enroll directly into a Neuroscience undergraduate program. We do not expect that late sophomores or higher ranks will change their majors to Neuroscience; the lock-step nature of the Neuroscience program would put upper level re-deciders at a disadvantage in terms of timely progress to their degrees. By the second year of the program, we expect that the majority of new first-semester students to come from external sources. Advertising, recruiting, pre-med advising, UAFYE promotions, and so forth will have become well-established by the second year.²

5. Student Enrollment

Even without a formal major there are currently a nontrivial number of students at Ohio State currently with Personal Study Plans (PSP) who could be considered *de facto* neuroscience majors. Another indicator of the need for a formal Neuroscience major is the growing popularity of the Neuroscience minor, which was approved by OAA in 2005. By 2008, 35 students had declared a Neuroscience minor. In just two years the number of minors has doubled (70 neuroscience minors in SP10). Moreover, recruiting staff in ASC and telemarketing staff in UAFYE have been noticing increased numbers of requests over the past year from prospective students interested in an undergraduate neuroscience major. It is difficult to forecast, but based on other schools' experiences, it is likely that Ohio State will see >100 majors within 2-3 years. As our initial class of Neuroscience majors graduate and successfully matriculate into high quality professional schools and Ph.D. programs it seems reasonable to expect this number to double within the following 2-3 years. During the first four years, therefore, we anticipate accepting 35-60 new majors per year.

We expect that four of the five core courses will experience heavier demand within the first year or two of the launch of the major. Both the Department of Neuroscience in the College of Medicine (Neuroscience 3000 and 3050) and the Department of Psychology in the College of Arts and Sciences (Psychology 2313 and 2513) have assured us that they have the capacity to meet the expected increased demand.

² Interestingly, Indiana University had the same expectations when their program was initially offered, but had been surprised when the majority of its first class had come from external, rather than internal sources.

6. Curricular Requirements

The proposed major in Neuroscience will offer a central foundational core set of courses that each major will take early in his/her tenure (**15 credit hours**). These core courses will serve as prerequisites for many of the advanced offerings. Majors then declare a specialization in one of three focal tracks in the neurosciences in order to obtain an in-depth knowledge of a sub-discipline within the field. Majors will also be required to take two additional courses in either or both of the other tracks in order to obtain a certain degree of breadth in the field (**21 credit hours**). Collectively, the Neuroscience Major will require successful (C or better) completion of **36 degree hours**. In addition, the conduct of undergraduate research, particularly among those majors with graduate or professional school aspirations, will be highly advised. This proposal is accompanied by four appendices (A, B, C, & D). A more specific breakdown of the requirements of the major, as well as a list of all courses (department, title, description, and prerequisites), is presented in **Appendix A**. Three sample 'pathways through the major' are depicted in **Appendix B** to illustrate the number of credits typically taken in the major and the fact that graduation is possible within the student's four year tenure. Note that, where a student chooses research for free electives, we expect that the student will enroll for 3 credit hours. **Appendix C** highlights the extensive number of neuroscience-related faculty (~80), representing multiple departments and colleges, located across our campus. A significant number of this faculty is already committed to the Neuroscience major as teaching faculty and potential supervisors of undergraduate research. We anticipate, with this large number of faculty specializing in every specialization area with the field of neuroscience, that additional courses will evolve over time. **Appendix D** provides information about distinguished undergraduate neuroscience programs culled from the websites of Indiana University, Johns Hopkins University, University of Pittsburgh, and two programs at the University of Michigan.

APPENDIX A
NEUROSCIENCE
PROPOSED BACHELOR OF SCIENCE MAJOR
(SEMESTER HOURS)

The proposed major in **Neuroscience** consists of a central foundational core of five courses which introduces students to the breadth of the field. These courses serve as prerequisites for many of the advanced offerings. It is expected that all core courses will be completed by the end of the 2nd year.

Upon completion of the core, students will declare one of three focal tracks of specialization in the neurosciences: *Molecular/Cellular Neuroscience*, *Systems/Behavioral Neuroscience*, and *Cognitive/Computational Neuroscience*. Majors will take five courses in their declared track, and two courses in at least one other track for additional breadth. Students will be strongly encouraged to include research hours in their programs. In some cases, a faculty advisor may approve substitution of research hours for one of the two breadth requirements when a student's research adds breadth to his/her declared specialization.

| | COURSE | DESCRIPTION | PREREQUISITES |
|---|---|--|--|
| NEUROSCIENCE REQUIRED CORE | Neurosci 3000: <i>Introduction to Molecular/Cellular Neuroscience</i> (3 hrs) | Introductory course covering organization & function of the nervous system at a level understandable to science & non-science majors. | Biology 1113 (4 hrs). |
| | Neurosci 3050: <i>Introduction to the Structure & Function of the Nervous System</i> (3 hrs) | The course will discuss basic principles of the anatomical & neurophysiological organization of the nervous system. | Biology 1114 OR Neurosci 3000 OR permission of instructor. |
| | Psych 2313: <i>Introduction to Behavioral Neuroscience</i> (3 hrs) | Introduction to the structure & function of the nervous system in relation to behavior. | Psych 1100 (3 hrs). |
| | Psych 2513: <i>Introduction to Cognitive Neuroscience</i> (3 hrs) | Examination of the neuroscientific approach to the study of cognition; primary focus on the psychobiology of memory, attention, language, & spatial orientation. | Psych 1100 (3 hrs). |
| | 5 COURSES 15 SEMESTER HRS | Data Analysis: <i>Choose 1 from the list in the Description section to the right.</i> | 1. Stats 2180: <i>Intro to Statistics for the Life Sciences</i> (3 hrs) OR 2. Stats 2450: <i>Intro to Statistical Analysis</i> (3 hrs) OR 3. Psych 2220: <i>Intro to Data Analysis in Psychology</i> (3 hrs) OR 4. MolGen 5650: <i>Analysis & Interpretation of Biological Data</i> (3 hrs) |

TRACK: **MOLECULAR/CELLULAR NEUROSCIENCE**

| | COURSE | DESCRIPTION | PREREQUISITES |
|--|---|---|---|
| MOLECULAR/ CELLULAR SPECIALIZATION <hr style="border: 1px solid red;"/> 5 COURSES | Psych 2305: <i>Drugs & Behavior</i> (3 hrs) | Introduction to the psychology of licit & illicit psychoactive drug use. | Psych 1100. |
| | Neurosci 3010: <i>Neurophysiology</i> (3 hrs) | The course will discuss basic principles of neurophysiology working from the level of the ion channel to the whole system. | NeuroSci 3000 or NeuroSci 3050 or permission of instructor. |
| | Psych 4501: <i>Advanced Behavioral Neuroscience</i> (3 hrs) | Advanced discussion of contemporary issues in psychobiology, including: synaptic pharmacology, drugs, & behavior, neurodegenerative diseases & the biological bases of psychopathology. | Psych 2313. |
| | Psych 4644: <i>Hormones & Behavior</i> (3 hrs) | Exploration of the interactions among hormones, brain & behavior through an integrative approach. | Psych 2313. |
| | Neurosci 7050: <i>Neurobiology of Disease</i> (3 hrs) | This course will explore the basis of major diseases affecting the nervous system. | NeuroSci 3000 or permission of instructor. |
| | Molecular Virology & Immunology 7500: <i>Neuroimmunology</i> (3 hrs) | This course will explore research & clinical applications of inflammatory processes within the central nervous system with special emphasis on neurodegenerative disorders, autoimmune disease & neurotrauma (e.g., spinal injury). | Permission of instructor. |
| | Neurosci 7001: <i>Foundations of Neuroscience</i> (3 hrs) | This course will discuss basic principles of the cellular, molecular, and neurophysiological organization of the nervous system. | Permission of instructor. |
| | Neurosci 7009: <i>Neurodevelopment</i> (3 hrs) | Interdisciplinary approach to the development of neural cells and the formation and maturation of vertebrate and invertebrate nervous systems. | Permission of instructor. |
| | Biochem 4511*: <i>Intro to Biological Chemistry</i> (4 hrs) | An introductory course in biochemistry dealing with the molecular basis of structure and metabolism of plants, animals, and microorganisms. Strongly recommended for pre-med students. | (Chem 1220 or 1250) + (Chem 2310 or 2520) + 2 semesters of Bio Sci. |
| | MolGen 4500**: <i>General Genetics</i> (4 hrs) | The principles of genetics, including molecular genetics, transmission genetics of prokaryotes and eukaryotes, developmental and non-chromosomal genetics, and the genetics and evolution of populations. Strongly recommended for pre-med students. | Biology 1113 + 3 add'l hours in Bio Sci. |

* The prerequisites for Biochem 4511 as identified here are expected to change. Faculty advisors will encourage Honors students to substitute Biochem 5613 + 5614 for Biochem 4511 in their contracts.

** Faculty advisors will encourage Honors students to substitute MolGen 5606 for MolGen 4500 in their contracts.

TRACK: **SYSTEMS/BEHAVIORAL NEUROSCIENCE**

| | COURSE | DESCRIPTION | PREREQUISITES |
|--|--|---|---|
| <p style="text-align: center;">SYSTEMS/ BEHAVIORAL SPECIALIZATION</p> <hr/> <p style="text-align: center;">5 COURSES</p> | Psych 2305: <i>Drugs & Behavior</i> (3 hrs) | Introduction to the psychology of licit & illicit psychoactive drug use. | Psych 1100. |
| | Psych 4501: <i>Advanced Behavioral Neuroscience</i> (3 hrs) | Advanced discussion of contemporary issues in psychobiology, including: synaptic pharmacology, drugs, & behavior, neurodegenerative diseases & the biological bases of psychopathology. | Psych 2313. |
| | EEOB 4550: <i>Neurobiology of Animal Behavior</i> (3 hrs) | Integration of studies of sensory, integrative and motor systems with evolution and ecology. | Two courses in the Biological Sciences or permission of instructor |
| | Psych 4623: <i>Biological Clocks & Behavior</i> (3 hrs) | Biological rhythms of animals & humans, including ultradian, daily, lunar, tidal & annual cycles; role of nervous & endocrine systems in relation to behavioral rhythms. | Psych 2313 or permission of instructor. |
| | Psych 4644: <i>Hormones & Behavior</i> (3 hrs) | Exploration of the interactions among hormones, brain & behavior through an integrative approach. | Psych 2313. |
| | Psych 5613H: <i>Biological Psychiatry</i> (3 hrs) | Provides a contemporary overview of the biological bases of several significant psychopathologies, including: mood disorders, schizophrenia, & PTSD/dissociative identity disorders. | Psych 4501 or permission of instructor. |
| | Psych 5898: <i>Seminar in Behavioral Neuroscience</i> (3 hrs) | Team-taught seminar on selected topics from contemporary research areas in the field of behavioral neuroscience | Psych 4501 or permission of instructor. |
| | Biochem 4511*: <i>Intro to Biological Chemistry</i> (4 hrs) | An introductory course in biochemistry dealing with the molecular basis of structure and metabolism of plants, animals, and microorganisms. Strongly recommended for pre-med students. | (Chem 1220 or 1250) + (Chem 2310 or 2520) + 2 semesters of Bio Sci. |
| | MolGen 4500**: <i>General Genetics</i> (4 hrs) | The principles of genetics, including molecular genetics, transmission genetics of prokaryotes and eukaryotes, developmental and non-chromosomal genetics, and the genetics and evolution of populations. Strongly recommended for pre-med students. | Biology 1113 + 3 add'l hours in Bio Sci. |

* The prerequisites for Biochem 4511 as identified here are expected to change. Faculty advisors will encourage Honors students to substitute Biochem 5613 + 5614 for Biochem 4511 in their contracts.

** Faculty advisors will encourage Honors students to substitute MolGen 5606 for MolGen 4500 in their contracts.

TRACK: **COGNITIVE/COMPUTATIONAL NEUROSCIENCE**

| | COURSE | DESCRIPTION | PREREQUISITES |
|---|--|---|---|
| <p>COGNITIVE/ COMPUTATIONAL SPECIALIZATION</p> <hr/> <p>5 COURSES</p> | Psych 2310: <i>Sensation & Perception</i> (3 hrs) | Examination of how observers perceive their environment through sensory information; emphasis on major sensory systems including vision, audition, spatial orientation, touch, taste & olfaction. | Psych 1100. |
| | Psych 5600: <i>Psychobiology of Learning & Memory</i> (3 hrs) | Course will integrate coverage of animal learning & human memory, focusing on three key components of the field: behavioral processes, brain systems, & clinical perspectives. | Psych 1100. |
| | Psych 5606: <i>High-Level Vision</i> (3 hrs) | Examines the perceptual processes by which humans & other animals are able to obtain knowledge about the three-dimensional environment. | Psych 2310. |
| | Psych 5608: <i>Introduction Mathematical Psychology</i> (3 hrs) | Survey of mathematical & computational modeling in psychology. Topics include psychophysical scaling, information processing, probabilistic choice, signal detection theory, model comparison, & Bayesian graphical modeling. | Psych 3321. |
| | Psych 5609: <i>Introduction to Mathematical Models in Experimental Psychology</i> (3 hrs) | An introduction to cognition with a focus on the application of mathematical models. Topic areas include memory, decision making, categorization, word recognition, priming, & reaction time. | Psych 5608. |
| | Psych 5612; CSE 5612; Ling 5612; or Philos 5612: <i>Introduction to Cognitive Science</i> (3 hrs) | Cognitive science is an interdisciplinary study of the nature of human thought; psychological, philosophical, linguistic, & artificial intelligence approaches to knowledge representation. | 12 credit hrs from 2 of the following areas: CIS, Linguistics, Philosophy, or Psychology. |
| | Psych 5614: <i>Cognitive Neuroscience</i> (3 hrs) | Neuronal mechanisms of information processing | Psych 2313 or 2513 or permission of instructor. |
| | Psych 5617: <i>Models of Memory</i> (3 hrs) | Basic principles of neural network modeling & their applications in perception, memory, & language. | Permission of instructor. |
| | CSE 5526: <i>Introduction to Neural Networks</i> (3 hrs) | Survey of fundamental methods & techniques of neural networks. Single- and multi-layer perceptrons; radial-basis function networks; support vector machines; recurrent networks; supervised & unsupervised learning. | CSE 3521 or permission of instructor. |
| | CSE 5539: <i>Intermediate Studies in AI</i> (3 hrs) | Neural network theories & computational models of brain functions. Topics include auditory & visual perception, learning, memory organization, & sensorimotor coordination. | Grad standing, any neural network course, or permission of instructor. |
| SHS 5760: <i>Neurology of Speech, Language, & Hearing Sciences</i> (3 hrs) | Structure & function of the central & peripheral nervous systems as they relate to speech & hearing. | Grad standing in SHS or permission of instructor. | |

| NEUROSCIENCE MAJOR: REQUIRED HOURS BY SPECIALIZATION | | |
|--|--|--|
| <u>Molecular/Cellular Specialization</u> | <u>Systems/Behavioral Specialization</u> | <u>Cognitive/Computational Specialization</u> |
| Core 15 hours | Core 15 hours | Core 15 hours |
| Core Prerequisites ¹ 12 hours | Core Prerequisites ¹ 12 hours | Core Prerequisites ¹ 12 hours |
| Specialization 21 hours | Specialization 21 hours | Specialization 21 hours |
| Total Minimum Hours Required for Specialization ² 48 hours | Total Minimum Hours Required for Specialization ² 48 hours | Total Minimum Hours Required for Specialization ² 48 hours |

¹ Core prerequisites: Biology 1113 (4 hours); Math 1150 or 1151.01 (5 hours); Psychology 1100 (3 hours).

² Depending on the set of courses that a student chooses in a declared specialization, additional prerequisite hours may be required.

| Sample four-year plan B.S. Neuroscience: Molecular/Cellular Specialization | | | | | |
|--|----|--------------------------------------|----|--------------|-----|
| Year 1 | | | | | |
| Autumn | | Spring | | | |
| Psych 1100 (pre-req for Psych 2220) | 3 | Psych 2220 | 3 | | |
| Chem 1210 (co-req for Bio 1113) | 5 | NeuroSci 3000 | 3 | | |
| Bio 1113 (pre-req for NS 3000) | 4 | Bio 1114 (pre-req for BioChem 4511) | 4 | | |
| GE | 3 | Chem 1220 (pre-req for BioChem 4511) | 5 | | |
| Survey | 1 | | | | |
| Semester Hours | 16 | Semester Hours | 15 | Yearly Hours | 31 |
| Year 2 | | | | | |
| Autumn | | Spring | | | |
| NeuroSci 3050 | 3 | Psych 2513 | 3 | | |
| Chem 2310 (pre-req for BioChem 4511) | 5 | Psych 2313 | 3 | | |
| GE | 3 | GE | 3 | | |
| GE | 3 | GE | 3 | | |
| GE | 3 | GE | 3 | | |
| Semester Hours | 17 | Semester Hours | 15 | Yearly Hours | 32 |
| Year 3 | | | | | |
| Autumn | | Spring | | | |
| BioChem 4511 | 3 | Research 4998, 4998H, 4999, or 4999H | 1 | | |
| Research 4998, 4998H, 4999, or 4999H | 1 | NeuroSci 3010 | 3 | | |
| Psych 2305 | 3 | GE | 3 | | |
| GE | 3 | GE | 3 | | |
| GE | 3 | GE | 3 | | |
| | | GE | 3 | | |
| Semester Hours | 13 | Semester Hours | 16 | Yearly Hours | 29 |
| Year 4 | | | | | |
| Autumn | | Spring | | | |
| EEOB 4550 | 3 | Research 4998, 4998H, 4999, or 4999H | 1 | | |
| Research 4998, 4998H, 4999, or 4999H | 1 | Psych 4501 | 3 | | |
| MolGen | 3 | GE | 3 | | |
| GE | 3 | Free Elective | 3 | | |
| GE | 3 | Free Elective | 3 | | |
| GE | 3 | | | | |
| Semester Hours | 16 | Semester Hours | 13 | Yearly Hours | 29 |
| | | | | Total Hours | 121 |

NOTE: Where a student chooses research for free electives, we expect that the student will enroll for 3 credit hours.

| Sample four-year plan B.S. Neuroscience: Systems/Behavioral Neuroscience | | | | | |
|---|----|--------------------------------------|----|--------------|-----|
| Year 1 | | | | | |
| Autumn | | Spring | | | |
| Psych 1100 (pre-req for Psych 2220) | 3 | Psych 2220 | 3 | | |
| Chem 1210 (co-req for Bio 1113) | 5 | NeuroSci 3000 | 3 | | |
| Bio 1113 (pre-req for NS 3000) | 4 | Bio 1114 (pre-req for EEOB 4550) | 3 | | |
| GE | 3 | GE | 3 | | |
| Survey | 1 | GE | 3 | | |
| Semester Hours | 16 | Semester Hours | 15 | Yearly Hours | 31 |
| Year 2 | | | | | |
| Autumn | | Spring | | | |
| NeuroSci 3050 | 3 | Psych 2513 | 3 | | |
| Psych 2313 | 3 | Psych 4501 | 3 | | |
| GE | 3 | GE | 3 | | |
| GE | 3 | GE | 3 | | |
| GE | 3 | GE | 3 | | |
| Semester Hours | 15 | Semester Hours | 15 | Yearly Hours | 30 |
| Year 3 | | | | | |
| Autumn | | Spring | | | |
| Psych 4644 | 3 | EEOB 4550 | 3 | | |
| Psych 2305 | 3 | Research 4998, 4998H, 4999, or 4999H | 1 | | |
| Research 4998, 4998H, 4999, or 4999H | 1 | GE | 3 | | |
| GE | 3 | GE | 3 | | |
| GE | 3 | GE | 3 | | |
| GE | 3 | Free Elective | 3 | | |
| Semester Hours | 16 | Semester Hours | 16 | Yearly Hours | 32 |
| Year 4 | | | | | |
| Autumn | | Spring | | | |
| Psych 4623 | 3 | Psych 5600 | 3 | | |
| Research 4998, 4998H, 4999, or 4999H | 1 | Research 4998, 4998H, 4999, or 4999H | 1 | | |
| GE | 3 | Free Elective | 3 | | |
| GE | 3 | Free Elective | 3 | | |
| Free Elective | 3 | Free Elective | 3 | | |
| Free Elective | 3 | | | | |
| Semester Hours | 14 | Semester Hours | 15 | Yearly Hours | 29 |
| | | | | Total Hours | 121 |

NOTE: Where a student chooses research for free electives, we expect that the student will enroll for 3 credit hours.

| Sample four-year plan B.S. Neuroscience: Cognitive/Computational Specialization | | | | | |
|--|----|--------------------------------------|----|--------------|-----|
| Year 1 | | | | | |
| Autumn | | Spring | | | |
| Psych 1100 (pre-req for Psych 2220) | 3 | Psych 2220 | 3 | | |
| Chem 1210 (co-req for Bio 1113) | 5 | NeuroSci 3000 | 3 | | |
| Bio 1113 (pre-req for NS 3000) | 4 | GE | 3 | | |
| GE | 3 | GE | 3 | | |
| Survey | 1 | GE | 3 | | |
| Semester Hours | 16 | Semester Hours | 15 | Yearly Hours | 31 |
| Year 2 | | | | | |
| Autumn | | Spring | | | |
| NeuroSci 3050 | 3 | CSE 3521 (pre-req for CSE 5526) | 3 | | |
| Psych 2513 | 3 | Psych 3321 (pre-req for Psych 5608) | 3 | | |
| Psych 2313 | 3 | GE | 3 | | |
| GE | 3 | GE | 3 | | |
| GE | 3 | GE | 3 | | |
| Semester Hours | 15 | Semester Hours | 15 | Yearly Hours | 30 |
| Year 3 | | | | | |
| Autumn | | Spring | | | |
| Psych 5608 | 3 | Psych 5609 | 3 | | |
| CSE 5526 | 3 | Research 4998, 4998H, 4999, or 4999H | 1 | | |
| GE | 3 | GE | 3 | | |
| GE | 3 | GE | 3 | | |
| Free Elective | 3 | GE | 3 | | |
| | | Free Elective | 3 | | |
| Semester Hours | 15 | Semester Hours | 16 | Yearly Hours | 31 |
| Year 4 | | | | | |
| Autumn | | Spring | | | |
| Psych 4501 | 3 | Psych 5614 | 3 | | |
| Psych 5600 | 3 | Research 4998, 4998H, 4999, or 4999H | 1 | | |
| Research 4998, 4998H, 4999, or 4999H | 1 | GE | 3 | | |
| GE | 3 | Free Elective | 3 | | |
| GE | 3 | Free Elective | 3 | | |
| Free Elective | 3 | | | | |
| Semester Hours | 16 | Semester Hours | 13 | Yearly Hours | 29 |
| | | | | Total Hours | 121 |

NOTE: Where a student chooses research for free electives, we expect that the student will enroll for 3 credit hours.

MAJOR PROGRAM FORM

Name: _____
 Name.#: _____
 OSU Email Address: _____
 Expected Graduation Semester/Year: _____
 Other Major(s)/ Minor(s): _____

Student Signature _____
 Date _____
 Advisor Signature _____
 Date _____

CORE PREREQUISITES

| Course | Hours | Semester / Year | Course Grade |
|-----------------------------|-------|-----------------|--------------|
| Biology 1113 | 4 | | |
| Math 1150 OR 1151.01 | 5 | | |
| Psychology 1100 | 3 | | |

* Math 1151.xx is the minimum math requirement for the B.S. degree.

CORE

| Course | Hours | Semester / Year | Course Grade |
|---------------------------|-------|-----------------|--------------|
| Neuroscience 3000 | 3 | | |
| Neuroscience 3050 | 3 | | |
| Psychology 2313 | 3 | | |
| Psychology 2513 | 3 | | |
| Data Analysis (4 options) | 3 | | |

SPECIALIZATION: *MOLECULAR / CELLULAR NEUROSCIENCE*

A **minimum of 5 courses** is required from the approved list of 10 course options. Faculty advisors will strongly recommend that pre-med students choose Biochemistry 4511 and Molecular Genetics 4500 for two of these courses. Honors pre-med students will be encouraged to substitute Biochemistry 5613 plus 5614 for Biochemistry 4511, and to substitute Molecular Genetics 5606 for Molecular Genetics 4500. 7000-level courses require permission of the instructor.

| Course | Hours | Semester / Year | Course Grade |
|--------|-------|-----------------|--------------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

BREADTH REQUIREMENT

Students must choose 2 courses from at least one of the other two Neuroscience specializations, Systems/Behavioral Neuroscience and Cognitive/Computational Neuroscience. Faculty advisors may approve substitution of research hours when a student's research adds breadth to his/her program.

| Course | <input checked="" type="checkbox"/> | Hours | Semester / Year | Course Grade |
|--------|--|-------|-----------------|--------------|
| | <input type="checkbox"/> Research <input type="checkbox"/> Systems / Behavioral <input type="checkbox"/> Cognitive / Computational | | | |
| | <input type="checkbox"/> Research <input type="checkbox"/> Systems / Behavioral <input type="checkbox"/> Cognitive / Computational | | | |

**NEUROSCIENCE
BACHELOR OF SCIENCE
SYSTEMS / BEHAVIORAL NEUROSCIENCE SPECIALIZATION**

MAJOR PROGRAM FORM

Name: _____

Name.#: _____

OSU Email Address: _____

Expected Graduation Semester/Year: _____

Other Major(s)/Minor(s): _____

Student Signature _____

Date _____

Advisor Signature _____

Date _____

CORE PREREQUISITES

| Course | Hours | Semester / Year | Course Grade |
|-----------------------------|-------|-----------------|--------------|
| Biology 1113 | 4 | | |
| Math 1150 OR 1151.01 | 5 | | |
| Psychology 1100 | 3 | | |

* Math 1151.xx is the minimum math requirement for the B.S. degree.

CORE

| Course | Hours | Semester / Year | Course Grade |
|---------------------------|-------|-----------------|--------------|
| Neuroscience 3000 | 3 | | |
| Neuroscience 3050 | 3 | | |
| Psychology 2313 | 3 | | |
| Psychology 2513 | 3 | | |
| Data Analysis (4 options) | 3 | | |

SPECIALIZATION: SYSTEMS / BEHAVIORAL NEUROSCIENCE

A **minimum of 5 courses** is required from the approved list of 9 course options. Faculty advisors will strongly recommend that pre-med students choose Biochemistry 4511 and Molecular Genetics 4500 for two of these courses. Honors pre-med students will be encouraged to substitute Biochemistry 5613 plus 5614 for Biochemistry 4511, and to substitute Molecular Genetics 5606 for Molecular Genetics 4500.

| Course | Hours | Semester / Year | Course Grade |
|--------|-------|-----------------|--------------|
| | | | |
| | | | |
| | | | |
| | | | |

BREADTH REQUIREMENT

Students must choose 2 courses from at least one of the other two Neuroscience specializations, Molecular/Cellular Neuroscience and Cognitive/Computational Neuroscience. Faculty advisors may approve substitution of research hours when a student's research adds breadth to his/her program.

| Course | <input checked="" type="checkbox"/> | Hours | Semester / Year | Course Grade |
|--------|--|-------|-----------------|--------------|
| | <input type="checkbox"/> Research <input type="checkbox"/> Molecular / Cellular <input type="checkbox"/> Cognitive / Computational | | | |
| | <input type="checkbox"/> Research <input type="checkbox"/> Molecular / Cellular <input type="checkbox"/> Cognitive / Computational | | | |

NEUROSCIENCE
BACHELOR OF SCIENCE
COGNITIVE / COMPUTATIONAL NEUROSCIENCE SPECIALIZATION

MAJOR PROGRAM FORM

Name: _____
 Name.#: _____
 OSU Email Address: _____
 Expected Graduation Semester/Year: _____
 Other Major(s): _____
 Minor(s): _____

Student Signature _____
 Date _____
 Advisor Signature _____
 Date _____

CORE PREREQUISITES

| Course | Hours | Semester / Year | Course Grade |
|-----------------------------|-------|-----------------|--------------|
| Biology 1113 | 4 | | |
| Math 1150 OR 1151.01 | 5 | | |
| Psychology 1100 | 3 | | |

* Math 1151.xx is the minimum math requirement for the B.S. degree.

CORE

| Course | Hours | Semester / Year | Course Grade |
|---------------------------|-------|-----------------|--------------|
| Neuroscience 3000 | 3 | | |
| Neuroscience 3050 | 3 | | |
| Psychology 2313 | 3 | | |
| Psychology 2513 | 3 | | |
| Data Analysis (4 options) | 3 | | |

SPECIALIZATION: COGNITIVE / COMPUTATIONAL NEUROSCIENCE

A **minimum of 5 courses** is required from the approved list of 11 course options.

| Course | Hours | Semester / Year | Course Grade |
|--------|-------|-----------------|--------------|
| | | | |
| | | | |
| | | | |
| | | | |

BREADTH REQUIREMENT

Students must choose 2 courses from at least one of the other two Neuroscience specializations, Molecular/Cellular Neuroscience and Systems/Behavioral Neuroscience. Faculty advisors may approve substitution of research hours when a student's research adds breadth to his/her program.

| Course | <input checked="" type="checkbox"/> | Hours | Semester / Year | Course Grade |
|--------|---|-------|-----------------|--------------|
| | <input type="checkbox"/> Research <input type="checkbox"/> Molecular / Cellular <input type="checkbox"/> Systems / Behavioral | | | |
| | <input type="checkbox"/> Research <input type="checkbox"/> Molecular / Cellular <input type="checkbox"/> Systems / Behavioral | | | |

APPENDIX D

THE NEUROSCIENCE MAJOR

NEUROSCIENCE-RELATED FACULTY AND AREAS OF EXPERTISE

DEPARTMENT OF PSYCHOLOGY

| | |
|-----------------------------|-------------------------|
| Bernhardt-Walther, Dr. Dirk | Cognitive Neuroscience |
| Bruno, Dr. John | Behavioral Neuroscience |
| Cunningham, Dr. William | Social Neuroscience |
| Givens, Dr. Bennet | Behavioral Neuroscience |
| Leuner, Dr. Benedetta | Behavioral Neuroscience |
| Lindquist, Dr. Derick | Behavioral Neuroscience |
| Petrov, Dr. Alexander | Cognitive Neuroscience |
| Prakash, Dr. Ruchika | Clinical Neuroscience |
| Ratcliff, Dr. Roger | Cognitive Neuroscience |
| Sederberg, Dr. Per | Cognitive Neuroscience |
| Wenk, Dr. Gary | Behavioral Neuroscience |

NEUROSCIENCE GRADUATE STUDIES PROGRAM (NGSP)

| | |
|-------------------------|---|
| Adeli, Dr. Hojjat | Cognitive & Computational Neuroscience; analysis of EEG data in epilepsy and alzheimers |
| Anand, Dr. Rene | Neuropharmacology; nAChR's in neurodevelopmental disorders |
| Askwith, Dr. Candice | Molecular & Cellular NS; function of acid-sensing ion channels (ASIC) |
| Barth, Dr. Rolf | Neurotrauma, Neurological Disorders, and Gene Therapy; brain tumor therapies |
| Basso, Dr. Michele | Neurotrauma, Neurological Disorders, and Gene Therapy; mechanisms of regeneration and repair in SCI |
| Beattie, Dr. Christine | Developmental Neuroscience & Genetics; zebrafish models of spinal muscular atrophy (SMA) |
| Bernston, Dr. Gary | Behavioral NS; brain mechanisms in social NS |
| Bishop, Dr. Georgia | Systems NS; synaptic plasticity in cerebellar circuits |
| Boulant, Dr. Jack | Systems NS; hypothalamic control of body temp and fever |
| Boyd, Dr. Robert | Neuropharmacology; regulation of nAChR gene expression |
| Brown, Dr. Anthony | Molecular & Cellular NS; mechanism of slow axonal transport |
| Bruno, Dr. John | Behavioral NS; animal models of attentional dysfunction and schizophrenia |
| Buffington, Dr. Charles | Systems NS; lower urinary tract disorders in cats, feline personaility traits |
| Buford, Dr. John | Systems NS; neural control of movement |
| Burry, Dr. Richard | Molecular & Cellular NS; signal transduction pathways in development and regeneration of neurons |

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|------------------------|---|
| Chiocca, Dr. Antonio | NeuroOncology; cytotoxic viral therapy for brain tumors |
| DeVries, Dr. Courtney | Stress and Neuroimmunology; neuroendocrine mechanisms underlying social behavior and stress |
| During, Dr. Matthew | Neurotrauma, Neurological Disorders, and Gene Therapy; in vivo gene transfer in learning and neurological disease |
| El-Hodiri, Dr. Heithem | Developmental Neuroscience & Genetics; genetic regulation of early neural development in <i>Xenopus</i> |
| Enyeart, Dr. John | Systems NS; ion channels that control secretion and gene expression in endocrine cells |
| Fischer, Dr. Andrew | Molecular & Cellular NS; neural development, regeneration, and survival in the vertebrate retina |
| Givens, Dr. Bennet | Behavioral NS; neurobiological mechanisms of cognition |
| Godbout, Dr. Jonathan | Stress and Neuroimmunology; aging, neuroimmunology, and behavior |
| Gu, Dr. Chen | Molecular & Cellular NS; ion channel trafficking and neurological disease |
| Gu, Dr. Howard | Neuropharmacology; monoamine transporters in neurological and psychiatric disorders |
| Hartwick, Dr. Andrew | Systems NS; light sensitivity of melanopsin-containing retinal ganglion cells and the role of these neurons in regulating mammalian circadian rhythms |
| Henion, Dr. Paul | Developmental Neuroscience & Genetics; molecular regulation of embryonic cell diversification in zebrafish |
| Herman, Dr. Gail | Developmental Neuroscience & Genetics; mouse models of complex human developmental disorders involving cholesterol biosynthetic genes |
| Herness, Dr. Scott | Systems NS; signal transduction mechanisms in mammalian taste receptor cells |
| Hoyt, Dr. Kari | Molecular & Cellular NS; molecular mechanisms underlying loss of neurons in neurodegenerative disease |
| Jakeman, Dr. Lyn | Neurotrauma, Neurological Disorders, and Gene Therapy; mechanisms of regeneration and repair in SCI |

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|--|--|
| Jontes, Dr. James | Developmental Neuroscience & Genetics; mechanisms involved in synapse and circuit formation in zebrafish |
| Kaspar, Dr. Brian | Neurotrauma, Neurological Disorders, and Gene Therapy; mechanism(s) of neurodegeneration in Amyotrophic Lateral Sclerosis (ALS) |
| Kaur, Dr. Balveen | NeuroOncology; brain tumor therapy using cytotoxic "killer" viruses |
| Knopp, Dr. Michael | Cognitive & Computational NS; advanced imaging methods to assess function in the central and peripheral nervous system; PET/CT & PET/MRI |
| Kuret, Dr. Jeffrey | Molecular & Cellular NS; mechanisms underlying neurodegenerative disorders such as Alzheimer's disease |
| Kwon, Dr. Chang-Hyuk | NeuroOncology; mouse genetic models of glioblastoma |
| Lin, Dr. Chien-Liang | Molecular & Cellular NS; pathogenesis of neurodegenerative diseases - abnormal RNA processing and biology of glutamate transporters |
| Lovett-Racke, Dr. Amy | Stress and Neuroimmunology; pathophysiology of multiple sclerosis |
| Mangel, Dr. Stuart | Systems NS; synaptic plasticity and modulation in the retina; circadian rhythmicity |
| Martin, Dr. Paul | Molecular & Cellular NS; role of glycoylation in synapse formation and muscular dystrophy |
| McTigue, Dr. Dana | Neurotrauma, Neurological Disorders, and Gene Therapy; mechanisms of regeneration and repair in SCI |
| Mykytyn, Dr. Kirk | Molecular & Cellular NS; physiology and pathophysiology of neuronal cilia and ciliary signaling in the mammalian brain |
| Nakano, Dr. Ichiro | NeuroOncology; signaling pathways regulating survival of brain tumor stem cells and development of novel chemotherapeutic agents |
| Neff, Dr. Maria (Hadjiconstantinou, Maria) | Neuropharmacology; cellular, molecular and genomic substrate(s) of CNS disorders |
| Neff, Dr. Norton | Neuropharmacology; Parkinson's disease and aging |
| Nelson, Dr. Randy | Behavioral NS; behavioral endocrinology and chronobiology in rodents |
| Nishijima, Dr. Ichiko | Molecular & Cellular NS; molecular genetics of autism and other developmental disorders |

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| Oberdick, Dr. John | Molecular & Cellular NS; development and function of the cerebellum using genetically manipulated mouse models |
| Obrietan, Dr. Karl | Molecular & Cellular NS; mouse models of epilepsy and Huntingtons, neuronal signaling, circadian clock |
| Pitt, Dr. David | Neurotrauma, Neurological Disorders, and Gene Therapy; pathogenesis of chronic progression in MS |
| Quan, Dr. Ning | Stress and Neuroimmunology; pathophysiology of neuroimmune communication |
| Racke, Dr. Michael | Neurotrauma, Neurological Disorders, and Gene Therapy; animal model experimental autoimmune encephalomyelitis |
| Rafael-Fortney, Dr. Jill | Molecular & Cellular NS; pathogenesis of neuromuscular diseases, including Duchenne muscular dystrophy |
| Rotter, Dr. Andrej | Computational Neuroscience and Bioinformatics |
| Travers, Dr. Joseph | Systems NS; neuroanatomical, neurophysiological and neuropharmacological analysis of oromotor function |
| Travers, Dr. Susan | Systems NS; central nervous system processing of sensory signals arising from the mouth |
| Sadee, Dr. Wolfgang | Neuropharmacology; molecular structure and function of G-protein coupled receptors (GPCRs) with focus on opioid muscarinic cholincergic, and dopamine subtypes |
| Sheridan, Dr. John | Stress and Neuroimmunology; viral pathogenesis, anti-viral immunity and wound healing |
| Steinmetz, Dr. Joseph | Behavioral NS; psychobiology, neurobiology of learning and memory; clinical neuroscience; focus on cerebellum and hippocampus |
| Stephens, Dr. Robert | Systems NS; neurobiology of chronic pain syndromes such as fibromyalgia and related algescic disorders with a CNS component; visceral pain |
| Terman, Dr. David | Computational Neuroscience, Imaging, and Bioinformatics; mathematical and numerical techniques for analyzing neuronal network activity and rhythm |
| Trapp, Dr. Bruce | Neurotrauma, Neurological Disorders, and Gene Therapy; cellular and molecular biology of myelination, demyelination, and dysmyelination |
| Vaessin, Dr. Harald | Developmental Neuroscience and Genetics; regulation of cell proliferation and terminal differentiation during neurogenesis in Drosophila |

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|------------------------|--|
| Viapiano, Dr. Mariano | NeuroOncology; extracellular matrix in the central nervous system: organization and functions in neural development and disease |
| Wallace, Dr. Lane | Neuropharmacology; mechanisms underlying neurodegenerative diseases and drug abuse |
| Wenk, Dr. Gary | Behavioral NS; animal models of Alzheimer's disease and the impact of chronic brain inflammation upon neurodegenerative diseases |
| Whitacre, Dr. Caroline | Stress and Neuroimmunology; immune tolerance, CNS autoimmune disease, multiple sclerosis |
| Wood, Dr. Jackie | Systems NS; neurophysiologic control of mammalian gastrointestinal functions in health and disease states |
| Xu, Dr. Ronald | Computational Neuroscience, Imaging, and Bioinformatics; medical device design & innovation, biomedical imaging, tissue optics |
| Yoon, Dr. Sung | Molecular & Cellular NS; signal transduction of apoptosis, mechanisms of RacGTPase/RhoGTPase regulation in vitro and in vivo, spinal cord regeneration |
| Young, Dr. Anthony | Molecular & Cellular NS; regulation of gene expression in the CNS |

PARTICIPANTS FROM OTHER DEPARTMENTS OR PROGRAMS

| | |
|---------------------|--|
| Davis, Dr. James W. | Computer vision methods; visual perception, human-computer interaction; motion capture; artificial intelligence (Department of Computer Science and Engineering) |
| Milman, Dr. Lisa | Communication disorders; aphasia treatment; assessment and quantitative modeling of adult language disorders; multilingualism. (Department of Speech and Hearing Science) |
| Wang, Dr. DeLiang | Computational audition; biologically plausible neural computation for auditory and visual information processing; identification of large networks of coupled neural oscillators and their applications to scene analysis (Department of Computer Science and Engineering) |

APPENDIX E
UNDERGRADUATE NEUROSCIENCE MAJORS
INDIANA UNIVERSITY, JOHNS HOPKINS UNIVERSITY, UNIVERSITY OF PITTSBURGH
SUMMARY FROM WEBSITES

| | Indiana | JHU | Pitt |
|---|--|--|---|
| Program Title | Program in Neuroscience | Undergraduate Neuroscience Program | Neuroscience Major |
| Housed in | Dept of Psychological & Brain Sciences in the College of Arts and Sciences | Dept of Psychological & Brain Sciences in the Krieger School of Arts and Sciences | Dept of Neuroscience in the School of Arts and Sciences |
| Degree(s) Conferred | Bachelor of Science in Neuroscience; Neuroscience Certificate | Bachelor of Arts in Neuroscience | Bachelor of Science in Neuroscience |
| Advising for the Major | 3 advisors in the Dept of Psychological & Brain Sciences. | As soon as students declare their major, they will be assigned a faculty advisor with whom they will discuss their program completion. | Appears to be a single departmental advisor or, perhaps, an advising coordinator. |
| Minimum Required Hours for the Major | | 91 semester hours | 59 semester hours |
| Major Requirements | <p>Introductory courses: PSY P101 Introductory Psychology I or PSY P151 Introduction to Psychology I for Majors or PSY P155 Introduction to Psychological and Brain Sciences</p> <p>PSY P326 Behavioral Neuroscience or PSY P346 Neuroscience</p> <p>BIOL L112 Introduction to Biology: Biological Mechanisms or BIOL H112 Integrated Freshman Learning Experience II</p> <p>CHEM C117 Principles of Chemistry and Biochemistry</p> <p>CHEM C341 Organic Chemistry I Lectures or CHEM R340 Survey of Organic Chemistry</p> | <p>Sequence/Core Coursework (12 credits): 080.203 Cognitive Neuroscience 080.305 The Nervous System I 080.306 The Nervous System II 080.250 Neuroscience Lab</p> <p>Mathematics & Science (49 credits): 110.106 Calculus I for Biological Sciences (or 110.108) 110.107 Calculus II for Biological Sciences (or 110.109) 030.101 Introductory Chemistry I 030.105 Introductory Chemistry Laboratory I 030.204 Introductory Chemistry II 030.106 Introductory Chemistry Laboratory II 030.205 Introductory Organic Chemistry I 171.101 General Physics I (or 171.103) 171.111 General Physics Laboratory I 171.102 General Physics II (or 171.104) 171.112 General Physics Laboratory II</p> | <p>Required for the major: NROSCI 1000 Introduction to Neuroscience or NROSCI 1003 UHC (University Honors College) NROSCI 1011 Functional Neuroanatomy Prerequisite: NROSCI 1000/1003 NROSCI 1012 Neurophysiology Prerequisites: NROSCI 1000/1003, CHEM 0120, PHYS 0110 & 0111, MATH 0220 NROSCI 1017 Synaptic Transmission Prerequisite: NROSCI 1000/1003 NROSCI 1800 Neuroscience Writing Practicum 1 OR NROSCI 1962 Thesis Research Writing practicum Two advanced electives to be chosen from: NROSCI 1020 Homeostasis NROSCI 1800 Neuroscience Writing Practicum 1 OR NROSCI 1962 Thesis Research Writing practicum NROSCI 1030 Psychiatric Disorders and Brain Function NROSCI 1032 Functional Organization of the Human Nervous System</p> |

CHEM C343 Organic Chemistry I Laboratory
PHYS P201 General Physics for Sci Majors
PHYS P202 General Physics II for Sci Majors

Mathematics courses:

MATH M211 Calculus I **or**
Both MATH M119 Brief Survey of Calculus I
and MATH M120 Brief Survey of Calculus II

PSY (MATH) K300 Statistical Techniques

Basic non-neuroscience courses: Select three

CSCI A321 Computing Tools for Scientific Research
CHEM C342 Organic Chemistry II Lectures
BIOL L211 Molecular Biology
BIOL L312 Cell Biology
MATH M212 Calculus II
MATH M301 Linear Algebra and Applications
MATH M303 Linear Algebra for Undergraduates

Advanced neuroscience courses: Select four courses

PSY P337 Clinical Neuroscience
PSY P349 Cognitive Neuroscience
PSY P407 Drugs and the Nervous System
PSY P409 Neural Bases of Sensory Function

PSY P410 Development of the Brain and Behavior
PSY P411 Neural Bases of Learning and Memory
PSY P423 Human Neuropsychology
PSY P437 Neurobiology of Addictions
PSY P466 Molecular and Cellular Neurobiology
PSY P457 (any topic with P326 or P346 as a prerequisite) Topics in Psychology
BIOL L410 seminars as appropriate
Any graduate-level neuroscience course (PSY N500, N501).

Laboratory courses: Select one

PSY P426 Laboratory in Behavioral Neuroscience
PSY P433 Laboratory in Neuroimaging Methods
A neuroscience laboratory using one of the following for enrollment:
PSY P493 Supervised Research
PSY P494 Supervised Research II
PSY P499 Honors Thesis Research
BIOL L490 Individual Study

Add'l requirements for pre-med but not required by the major:

030.206 Introductory Organic Chemistry II
030.225 Organic Chemistry Laboratory

Cellular & Molecular Concentration (12 required):

020.305 Biochemistry
020.315 Biochemistry Lab
020.306 Cell Biology
020.315 Cell Biology Lab

Cognitive & Systems (12 required):

Students following a Cognitive or Systems Concentration track must complete either the above Biochemistry/Cell Biology sequence or the following:
020.151 General Biology I
020.153 General Biology Laboratory I
020.152 General Biology II
020.154 General Biology Laboratory II

Advanced Courses (12 credits):

Twelve (12) credits of advanced neuroscience coursework (300 level or above) are required for the major. Nine (9) of the credits must be in the student's chosen area of concentration. Only approved courses will be accepted. A list of applicable advanced level courses will be available two weeks prior to registration.

Research (6 credits):

Six (6) credits of research, obtained through work in one of the neuroscience laboratories participating in the program, are required for completion of the major. Students may take no more than 3 credits per term and no more than 6 credits per academic year.

NROSCI 1034 Neural Basis of Cognition
NROSCI 1035 Control of Movement
NROSCI 1036 Neurobiology of Aging
NROSCI 1040 Biological Bases of Learning and Memory
NROSCI 1041 Developmental Neuroscience
NROSCI 1042 Neurochemical Basis of Behavior
NROSCI 1046 Foundations of Clinical Neurophysiology

Required Capstone options:

NROSCI 1046 Topics in Neuroscience: Pro Seminar **Co-requisite:** NROSCI 1800
NROSCI 1046 Topics in Neuroscience: Foundations of Clinical Neurophysiology + Lab **Co-requisite:** NROSCI 1800
NROSCI 1901 Independent Research (2 terms, 2 credits per term)
NROSCI 1962 Thesis Writing Practicum
Prerequisites: 3 cr each, NROSCI 1901 & NROSCI 1961

Corequisite Courses:

BIOSC 0150, 0160, 0050, and 0060
Foundations of Biology 1 and 2 and labs
BIOSC 1000 Biochemistry

CHEM 0110 and 0120 General Chemistry 1 and 2
CHEM 0310 Organic Chemistry 1
CHEM 0320 Organic Chemistry 2
CHEM 0330 Organic Chemistry Lab 1
CHEM 0340 Organic Chemistry Lab 2
MATH 0220 Analytic Geometry and Calculus 1
NROSCI 1070 UHC Human Physiology **or** 1250 Human Physiology
PHYS 0174 and 0175 Basic Physics for Science and Engineering 1 and 2 **or** 0110 and 0111 Introduction to Physics 1 and 2

(Revised 12/11/09)

| | | | |
|--|---|--|--|
| | CHEM C409 Chemical Research PHYS S406 Research Project for Physics Majors (Updated 01/10) | | |
|--|---|--|--|

**UNDERGRADUATE NEUROSCIENCE MAJORS
UNIVERSITY OF MICHIGAN
SUMMARY FROM WEBSITE**

| | Michigan | Michigan |
|---|---|---|
| Program Title | Neuroscience Concentration (major) | Brain, Behavior, & Cognitive Science [BBCS] Concentration (major) |
| Housed in | Department of Psychology, and Department of Molecular, Cellular, and Developmental Biology, both in the College of Literature, Science, and the Arts (LSA) | Department of Psychology in the College of Literature, Science, and the Arts (LSA) |
| Degree(s) Conferred | Bachelor of Science | Bachelor of Science |
| Advising for the Major | <p>LSA general advising.</p> <p>Concentration (major) advising: Concentration/Minor Advisors are usually faculty or staff members from LSA departments who help students shape and focus their academic goals. They discuss with students how best to progress in a concentration program (or minor) and provide official confirmation to the LSA Auditors when a student has completed it. Concentration Advisors are good resources for providing information about graduate school in their field, and should be able to discuss how the skills acquired in the study of their discipline provide an excellent foundation for the professional world. Students meet with most of these advisors in their departmental offices.</p> | <p>LSA general advising.</p> <p>Concentration (major) advising: Concentration/Minor Advisors are usually faculty or staff members from LSA departments who help students shape and focus their academic goals. They discuss with students how best to progress in a concentration program (or minor) and provide official confirmation to the LSA Auditors when a student has completed it. Concentration Advisors are good resources for providing information about graduate school in their field, and should be able to discuss how the skills acquired in the study of their discipline provide an excellent foundation for the professional world. Students meet with most of these advisors in their departmental offices.</p> |
| Minimum Required Hours for the Major | 60 semester hours | 60 semester hours |

| <p>Major Requirements</p> | <p>Neuroscience requirements: ~ minimum of 36 credits is required</p> <p>~ Core: 4 courses required All of the following: PSYCH 230: Intro to Biopsychology BIOLOGY 222: From Message to Mind: An Intro to Neurobiology BIOLOGY 305: Genetics 1 of the following: BIOLOGY 310: Intro Biochemistry BIOLOGY 311: Intro Biochemistry BIOLCHEM 415: Intro Biochemistry</p> <p>~ Electives: 6 courses for a minimum 18 credits A. Lecture Courses at 200-300 level. At least one, and up to two courses from: BIO 225: Principles of Animal Physiology MCDB 307: Developmental Biology PSYCH 240: Intro to Cognitive Psychology PSYCH 345: Intro to Human Neuropsych B. Advanced lecture and discussion courses in Neuroscience. At least three courses (and up to five courses). At least one course must be from Group B1 and one course from Group B2. One advanced course from List C may be used toward this requirement. B1. Cell & Molecular Neuroscience: MCDB 402: Molecular Biology of Pain & Sensation MCDB 403: Molecular & Cell Biology of the Synapse MCDB 418: Endocrinology MCDB 422: Cellular & Molecular Neurobiology MCDB 426: Molecular Endocrinology B2. Behavioral Neuroscience: BIO 541/PSYCH 532: Mammalian Reproductive Endocrinology PSYCH 346: Learning & Memory PSYCH 347: Perception PSYCH 402: Special Problems in Psychology PSYCH 433: Biopsychology of Motivation PSYCH 434: Biopsychology of Learning & Memory PSYCH 435: Biological Rhythms & Behavior PSYCH 436: Drugs of Abuse, Brain & Behavior PSYCH 437: Current Topics in Biopsychology PSYCH 438: Hormones & Behavior PSYCH 531: Advanced Topics in Biopsychology PSYCH 533/NEUROSCI 520: Sleep: Neurobiology, Medicine & Society</p> <p>Additional courses may be approved as advanced neuroscience courses by the concentration advisory panel.</p> <p>C. Additional Advanced Courses MCDB 411: Protein Structure & Function MCDB 427: Molecular Biology MCDB 428: Cell Biology</p> | <p>BBCS requirements: ~ minimum of 24 credits in post-into courses</p> <p>~ of overall credit (prerequisites + concentration), 24 must be completed directly thru UMich's Psych Dept in Ann Arbor, letter graded, & 12 of these must at the 300-level or above</p> <p>~ 3rd course from gateway requirement may be used toward concentration requirements</p> <p>~ 12 credits in biopsychology or cognitive science, selected from the following list. Psychology 230, 335, 240, or 345 may be used only if they are not also used toward the Gateway Requirement above.</p> <p>PSYCH 230 (330): Intro to Biopsychology PSYCH 232: Evolutionary Bio & Human Disease PSYCH 240 (340): Intro to Cog Psych PSYCH 335 : Intro to Animal Behavior PSYCH 338 (437): Primate Social Behavior I PSYCH 344: 2nd Language Acquisition PSYCH 345: Intro to Human Neuropsychology PSYCH 346 (443): Learning & Memory PSYCH 347 (444): Perception PSYCH 348 (447): Psychology of Thinking PSYCH 349: Talking Minds PSYCH 400: Special Problems in Psychology as a Natural Science 1-4 cr PSYCH 420(507): Faculty Directed Advanced Tutorial Reading for Psychology as a Natural Science 1-6 cr PSYCH 431: Biopsych of Animal & Human Behavior PSYCH 432: Reproductive Behavior in Mammals PSYCH 433: Biopsych of Motivation PSYCH 434: Biopsych of Learning & Memory PSYCH 435: Bio Rhythms & Behavior PSYCH 436: Drugs of Abuse, Brain & Behavior PSYCH 437: Current Topics in Biopsych PSYCH 438: Hormones & Behavior PSYCH 439: Behavioral Biology of Women PSYCH 445: Psychology of Language PSYCH 446: Human Factors Psychology PSYCH 447: Current Topics in Cognition & Perception PSYCH 448: Mathematical Psychology PSYCH 449(542): Decision Processes PSYCH 530: Advanced Topics in Comparative & Evolutionary Psychology PSYCH 531: Advanced Topics in Biopsychology PSYCH 532: Mammalian Reproductive Endocrinology PSYCH 533: Sleep: Neurobio, Medicine, & Society PSYCH 541: Advanced topics in Cognition & Perception Other (as approved by Faculty Concentration Advisor)</p> |
|----------------------------------|--|---|

MCDB 435: Intracellular Trafficking
 EEB 492: Behavioral Ecology
 PSYCH 420: Faculty Directed Advanced Tutorial Reading for Psychology as a Natural Science
 PSYCH 447: Current Topics in Cognition & Perception
 STATS 350 or 400: Intro to Statistics & Data Analysis or Applied Statistical Methods
 STATS 401 or 405: Applied Statistical Methods II or Intro to Statistics
 Additional advanced courses may be approved as cognates by the concentration advisory panel.

~ Lab requirement

At least two different courses for a minimum of five credits total from the following categories, with at least one course being a Methods-Based laboratory (Note: Each course must be taken for a minimum of 2 credits each and be completed in a single academic term. Only 3 credits of independent study may count toward the concentration program):

A. Method-Based Laboratory courses:

Choose at least one course from:
 PSYCH 231/UC 261: Brain, Learning, & Memory
 BIOLOGY 226: Animal Physiology Laboratory
 MCDB 306: Intro Genetics Laboratory
 MCDB 308: Developmental Biology Laboratory
 MCDB 419: Endocrinology Laboratory
 MCDB 423: Intro to research in Cellular & Molecular Neurobiology
 MCDB 429: Laboratory in Cell & Molecular Biology

B. Research-Based Laboratory Courses

MCDB 300: Undergrad Research
 MCDB 400: Advanced Research
 PSYCH 326: Faculty Directed Early Research for Psychology as a Natural Science
 PSYCH 331/332: Labs in Biopsychology
 PSYCH 422: Faculty Directed Advanced Research for Psychology as a Natural Science

~ Quantitative Requirement Cognate

2 courses are required. If Stats 350, 400, 401, or 405 is used in Elective Group C, it cannot be used for a Quantitative Cognate. (While 100-level courses may be used to satisfy this requirement, the credits for 100-level courses may not be used toward the minimum number of credits required for the concentration).

STATS 350: Intro to Statistics & Data Analysis or STATS 400: Applied Statistical Methods.
 (Note: STATS 405 cannot be combined with STATS 350 or 400 to fulfill this requirement.)
 STATS 401: Applied Statistical Methods or STATS 405: Intro to Statistics
 PSYCH 448: Mathematical Psychology
 MATH 115: Calculus I or MATH 185

~ Lab Requirement

At least two different courses for a minimum of five credits total from the following list of classes. At least one course must come from the Methods-based lab group. Each course must be taken for a minimum of two credits and be completed in a single academic term. Only one non-departmental course may be elected to satisfy the lab requirement.

Methods-Based Lab Courses

PSYCH 231: Brain, Learning & Memory
 PSYCH 303: Research Methods in Psychology
 PSYCH 331/332: Labs in Biopsychology
 PSYCH 341: Advanced Lab in Cognitive Psychology
 PSYCH 342: Lab in Judgment & Decision Making

Biology-based Labs (courses not offered through the Psych Department; also considered Methods-Based Labs)

Only one biology-based lab may be used towards the BBC lab requirement.

Biology 226: Animal Physiology Lab
 Biology 429: Lab in Cell & Molecular Biology
 EEB 493: Lab in Animal Behavior
 MCDB 306: Intro Genetics Lab
 MCDB 308: Developmental Bio Lab
 MCDB 429: Lab in Cell & Molecular Biology

Research-Based Lab Courses

PSYCH 322 (408): Field Practicum in Research Techniques/Natural Science (*graded CR/NC*) **1-4 cr**
 PSYCH 326: Faculty Directed Early Research for Psychology as a Natural Science **1-4 cr**
 PSYCH 331/332: Advanced Lab in Biopsychology **4 cr**
 PSYCH 422 (505): Faculty Directed Independent Advanced Research/Natural Science **1-6 cr**
 PSYCH 424 (510): Senior Honors Research I/Natural Science **2-4 cr**
 PSYCH 426 (511): Seniors Honor Research II/Natural Science **2-4 cr**

~ Cognate Course Requirement

One course from the following list (or an approved substitute):
 Anthro 467: Human Behavioral Ecology
 Anthro 568: Primate Behavioral Ecology & Sociobio
 Biology 208: Intro to Embryology
 Biology 222: Intro to Neurobiology
 Biology 225: Principles of Animal Physiology: Lecture
 Biology 305: Genetics
 Biology 310 (or 311 or 412): Intro to Biochemistry
 Biology 390 : Evolution
 Biochemistry 415: Intro to Biochemistry
 Chemistry 351: Fundamentals of Biochem
 EEB 381: General Ecology
 EEB 433: Ornithology
 EEB 440: Biology of Fishes
 EEB 442: Biology of Insects
 EEB 450: Biology of Amphibians & Reptiles

MATH 116: Calculus II or MATH 186
 PHYSICS 125 or 140 or 160: General Physics I
 PHYSICS 126 or 240 or 260: General Physics II

It is recommended that students interested in pursuing advanced training in Cellular and Molecular Neuroscience elect MATH 115 and 116, CHEM 230, PHYSICS 125/126 & 127/128 OR 140/141 & 240/241. Those interested in advanced training in Behavioral Neuroscience should take at least one Statistics course.

Students intending to go to graduate school should have at least 2 terms of research experience. Most graduate school-bound students will have 1-2 graded research courses (2-4 credits/each) on record. Students intending to go to graduate school in Neuroscience within a CMB-type program will need research experience as well as 2 terms of Calculus and 2 terms of Physics. Students intending to go to medical school will need to take 2 terms of Physics and CHEM 230.

EEB 451: Biology of Mammals
 EEB 478: Advanced Ecology
 EEB 481: Population Dynamics & Ecology
 EEB 492: Behavioral Ecology
 EECS 281: Data Structure & Algorithms
 EECS 492: Intro to Artificial Intelligence
 Linguistics 315: Intro to Sentence Analysis
 Linguistics 514: Semantics & Pragmatics
 Linguistics 555: Intro to Cognitive Grammar
 MCDB 307: Developmental Biology
 MCDB 418: Endocrinology
 MCDB 422: Cellular & Molecular Neurobiology
 MCDB 425: Systems Neurobiology
 MCDB 534: Developmental Neurobiology
 Philosophy 345: Language & Mind
 Philosophy 450: Philosophy of Cognition
 Philosophy 482: Philosophy of the Mind
 Statistics 406: Intro to Statistical Computing

**LETTERS OF SUPPORT
FOR
THE PROPOSED NEUROSCIENCE MAJOR**

Department of Neuroscience



Randy J. Nelson, Ph.D.
Dr. John D. and E. Olive Brumbaugh
Chair in Brain Research and Teaching
Department Of Neuroscience
Professor and Chair
4084 Graves Hall
333 West 10th Avenue
Columbus, OH 43210
Phone: 614-688-8327
Fax: 614-688-8742

25 October 2010

Dr. Joseph E. Steinmetz, Dean
College of Arts and Sciences
The Ohio State University
186 University Hall
230 North Oval Mall
Columbus, OH 43210-1319

Dear Dr. Steinmetz:

I am writing on behalf of the faculty of the Department of Neuroscience in strong support of the proposed undergraduate major in Neuroscience. Our faculty are committed to teaching a number of courses in the major and providing meaningful research experiences to undergraduate who seek them. Thus, we are in concurrence with the need for this major at Ohio State.

Sincerely,

Randy J. Nelson, Brumbaugh Chair in Brain Research and Teaching
Professor and Chair, Department of Neuroscience



Department of Psychology

225 Psychology Building
1835 Neil Avenue
Columbus, OH 43210

www.psy.ohio-state.edu

November 8, 2010

Dr. Joseph E. Steinmetz, Dean
Colleges of Arts and Sciences
The Ohio State University
186 University Hall
230 North Oval Mall
Columbus, OH 43210

Dear Dr. Steinmetz:

I am writing on behalf of the faculty of the Department of Psychology in strong support of the proposed undergraduate major in *Neuroscience*. As you are aware, the Department has a strong representation of faculty with considerable expertise in behavioral, cognitive, and computational neuroscience. For years now, we have participated, in a major way, in the Neuroscience minor program. Our faculty is committed to continue offering courses that will be of considerable interest (both core and elective courses) to the *Neuroscience Major*. Moreover, we are willing to help provide undergraduate research experiences, in the laboratories of our faculty, for those students who desire them.

In closing, when one surveys the state and national landscapes, it becomes quickly apparent that we are one of the few schools (within our benchmark cohort and within the State of Ohio) not to offer a degree program in Neuroscience. When you consider the popularity of this major and the large number of OSU faculty (in multiple departments and colleges) with expertise in the neurosciences, then you are left to conclude that we are quite overdue for the development of this major. Thus, the Department of Psychology concurs with the need for the *Neuroscience Major* here at The Ohio State University.

Sincerely,

A handwritten signature in blue ink, appearing to read "Thomas E. Nygren".

Thomas E. Nygren
Interim Chair
Department of Psychology



Neuroscience Graduate Studies Program

4058 Graves Hall
333 W. 10th Avenue
Columbus, OH 43210
Phone (614) 292-2379
Fax (614) 292-0490

October 27, 2010

Dr. Joseph E. Steinmetz, Dean
College of Arts and Sciences
The Ohio State University
186 University Hall
230 North Oval Mall
Columbus, OH 43210-1319

Dear Joe,

We are writing in very strong support of the proposal for an undergraduate Neuroscience Major at Ohio State. This integrative and interdisciplinary course of study will fill a much needed gap in the current training opportunities for Ohio State undergraduates interested in careers in neuroscience research, and in our opinion, it is long overdue.

As you know the Neuroscience Graduate Studies Program (NGSP) currently has 70+ faculty and almost 40 graduate students engaged in all major subdisciplines of neuroscience research. This is an incredible training resource with fantastic potential for identifying, educating, and harnessing the best undergraduate talent Ohio State has to offer towards the goal of producing the next generation of top neuroscience researchers. At the same time the quality of undergraduates at Ohio State is very high, and the Neuroscience Major will potentially serve as a means to introduce a relatively untapped and well-educated work-force into neuroscience laboratories, as well as provide a potential feeder program for the NGSP and Psychology graduate programs. Many of our faculty members already teach introductory and advanced graduate courses as part of the NGSP core curriculum, ourselves included, and these courses are already incorporated in the proposed curriculum for the major. For example, NeuroSc7001, Foundations of Neuroscience, teaches basic principles of the cellular, molecular and neurophysiological mechanisms of neural development and function, and draws heavily from primary research papers and modern methodologies. Likewise NeuroSc7050, Neurobiology of Disease, instructs students in the molecular, genetic, and environmental bases of neurological and psychiatric disorders, and mechanisms of brain and spinal cord repair after trauma. These and other courses taught by our faculty are certain to attract and engage the best undergraduate minds interested in neuroscience, and our laboratories will be opened for those students interested to go to the next level: hands-on, cutting-edge research in some of the best labs in the country.

Once again we whole-heartedly endorse the proposed Neuroscience Major and will help in any way possible to make it a success.

Sincerely,

Two handwritten signatures in blue ink. The first signature is 'Dana McTigue' and the second is 'John Oberthur'.

Dana McTigue and John Oberthur
Co-Directors, Neuroscience Graduate Studies Program
The Ohio State University



186 University Hall

230 N. Oval Mall

John Bruno
Department of Psychology
057 Psychology Building
1835 Neil Ave
CAMPUS

Dear John:

On behalf of the Division of Natural and Mathematical Sciences (NMS) I am pleased to provide my support for an undergraduate neuroscience program at OSU and welcome in particular the interdisciplinary Neuroscience major that you are proposing. I am satisfied that the current version incorporates many of the suggestions as they were conveyed by members of the NMS Disciplinary Advisory Panel, including

- permitting research hours to substitute for one of the two breadth requirements,
- the addition of Statistics 2450 as a data analysis option in the core along with Statistics 2180, statistics for the life sciences, and
- the addition of Biochemistry 4511 and Molecular Genetics 4500 (or Molecular Genetics 5606 for honors students—note that both of these courses are listed in the current proposal under their quarter numbers) as options for the *Molecular/Cellular* and the *Systems/Behavioral* specializations.

This should be a strong program. I give you my best wishes for a successful effort.

Sincerely,

C. David Andereck
Professor of Physics
Associate Dean of Arts and Sciences

Prof. Joseph Steinmetz Executive Dean Arts and Sciences

Dear Dean Steinmetz:

I am writing in support of the new undergraduate interdisciplinary major in Neuroscience, to begin in the fall of 2012, that is being proposed. Neuroscience is an interdisciplinary area that is growing at many levels of analysis including cellular/molecular, systems/behavioral, and cognitive/computational. The last of these is of particular interest to our students and faculty, especially those with interests in artificial intelligence. Hence there are excellent opportunities for interactions and synergies between CSE and the students in the proposed program and we look forward to working closely with them.

If you have any questions or comments, please email me.

Thank you and best wishes.

Sincerely,

Neelam Soundarajan Acting Assoc. Chair, CSE Dept.

LEARNING GOALS

1. Students acquire a strong foundational background in core disciplines of the field of neuroscience.
2. Students acquire statistical skills.
3. Students acquire advanced information in the areas of molecular/cellular neuroscience, systems/behavioral neuroscience, or cognitive/computational neuroscience.
4. Students engage in critical reading of the primary scientific literature in several of their advanced courses.

KEY TO LEARNING GOAL LEVELS

- F = Foundational
- I = Intermediate
- A = Advanced

PREREQUISITES

| Course Number | Course Title | Semester Hours | Learning Goals | | | |
|---------------|---|----------------|----------------|---|---|---|
| | | | 1 | 2 | 3 | 4 |
| Bio 1113 | <i>Biological Sciences: Energy Transfer & Development</i> | 4 | F | | | |
| Psych 1100 | <i>General Psychology</i> | 3 | F | | | |
| Math 1151 | <i>Calculus 1</i> | 5 | F | F | | |

CORE: All Required

| Course Number | Course Title | Semester Hours | Learning Goals | | | |
|------------------------------|---|----------------|----------------|---|---|---|
| | | | 1 | 2 | 3 | 4 |
| Neurosci 3000 | <i>Introduction to Molecular/Cellular Neuroscience</i> | 3 | F | | F | |
| Neurosci 3050 | <i>Introduction to the Structure & Function of the Nervous System</i> | 3 | I | | I | I |
| Psych 2313 | <i>Introduction to Behavioral Neuroscience</i> | 3 | F | | F | |
| Psych 2513 | <i>Introduction to Cognitive Neuroscience</i> | 3 | I | | I | |
| Data Analysis (4 options) | 1. <i>Stats 2180: Intro to Statistics for the Life Sciences, OR</i> | 3 | | I | | I |
| | 2. <i>Stats 2450: Intro to Statistical Analysis, OR</i> | | | I | | I |
| | 3. <i>Psych 2220: Intro to Data Analysis in Psychology, OR</i> | | | I | | I |
| | 4. <i>MolGen 5650: Analysis & Interpretation of Biological Data</i> | | | A | | A |

| TRACK: Molecular/Cellular Neuroscience (5 Courses Required) | | | | | | |
|---|---|----------------|----------------|---|---|---|
| Course Number | Course Title | Semester Hours | Learning Goals | | | |
| | | | 1 | 2 | 3 | 4 |
| Psych 2305 | <i>Drugs & Behavior</i> | 3 | I | | I | |
| Neurosci 3010 | <i>Neurophysiology</i> | 3 | I | | I | I |
| Psych 4501 | <i>Advanced Behavioral Neuroscience</i> | 3 | | | A | A |
| Psych 4644 | <i>Hormones & Behavior</i> | 3 | | | A | I |
| Neurosci 7050 | <i>Neurobiology of Disease</i> | 3 | | | A | A |
| Molecular Virology & Immunology 7500 | <i>Neuroimmunology</i> | 3 | | | A | A |
| Neurosci 7001 | <i>Foundations of Neuroscience</i> | 3 | | | A | A |
| Neurosci 7009 | <i>Neurodevelopment</i> | 3 | | | A | A |
| Biochem 4511* | <i>Intro to Biological Chemistry</i> | 4 | | | A | I |
| MolGen 4500** | <i>General Genetics</i> | 4 | | | A | I |

* Faculty Advisors will encourage Honors students to substitute Biochem 5613 + 5614 for Biochem 4511 in their contracts.

** Faculty advisors will encourage Honors students to substitute MolGen 5606 for MolGen 4500 in their contracts.

| TRACK: Systems/Behavioral Neuroscience (5 Courses Required) | | | | | | |
|---|---|----------------|----------------|---|---|---|
| Course Number | Course Title | Semester Hours | Learning Goals | | | |
| | | | 1 | 2 | 3 | 4 |
| Psych 2305 | <i>Drugs & Behavior</i> | 3 | I | | I | |
| Psych 4501 | <i>Advanced Behavioral Neuroscience</i> | 3 | | | A | A |
| EEOB 4550 | <i>Neurobiology of Animal Behavior</i> | 3 | | | A | A |
| Psych 4623 | <i>Biological Clocks & Behavior</i> | 3 | | | A | A |
| Psych 4644 | <i>Hormones and Behavior</i> | 3 | | | A | I |
| Psych 5613H | <i>Biological Psychiatry</i> | 3 | | | A | A |
| Psych 5898 | <i>Seminar in Behavioral Neuroscience</i> | 3 | | | A | A |
| Biochem 4511* | <i>Intro to Biological Chemistry</i> | 4 | | | A | I |
| MolGen 4500** | <i>General Genetics</i> | 4 | | | A | I |

* Faculty Advisors will encourage Honors students to substitute Biochem 5613 + 5614 for Biochem 4511 in their contracts.

** Faculty advisors will encourage Honors students to substitute MolGen 5606 for MolGen 4500 in their contracts.

| TRACK: Cognitive/Computational Neuroscience (5 Courses Required) | | | | | | |
|---|--|----------------|----------------|---|---|---|
| Course Number | Course Title | Semester Hours | Learning Goals | | | |
| | | | 1 | 2 | 3 | 4 |
| Psych 2310 | <i>Sensation & Perception</i> | 3 | I | | I | |
| Psych 5600 | <i>Psychobiology of Learning & Memory</i> | 3 | | | A | A |
| Psych 5606 | <i>High-Level Vision</i> | 3 | | | A | A |
| Psych 5608 | <i>Intro to Mathematical Psychology</i> | 3 | | A | A | A |
| Psych 5609 | <i>Intro to Mathematical Models in Experimental Psychology</i> | 3 | | A | A | A |
| Psych 5612 OR CSE 5612 OR Ling 5612 OR Philos 5612 | <i>Intro to Cognitive Science</i> | 3 | | | A | A |
| Psych 5614 | <i>Cognitive Neuroscience</i> | 3 | | | A | A |
| Psych 5617 | <i>Models of Memory</i> | 3 | | | A | A |
| CSE 5539 | <i>Brain Theory & Neural Networks</i> | 3 | | | A | A |
| SHS 5760 | <i>Neurology of Speech, Language, & Hearing Sciences</i> | 3 | | | A | A |

| UNDERGRADUATE RESEARCH | | | | | | |
|-------------------------------|---|----------------|----------------|---|---|---|
| Course Number | Course Title | Semester Hours | Learning Goals | | | |
| | | | 1 | 2 | 3 | 4 |
| XXX 4998 (H) | <i>Undergrad Research OR Undergrad Honors Research</i> | Varies | | | A | A |
| XXX 4999 (H) | <i>Undergrad Research OR Undergrad Honors Research</i> | Varies | | | A | A |