

Program Planning Summary

Neuroscience Major
AB/BA/BS

A handwritten signature in blue ink on a light yellow background, reading "P. George Benson".

P. George Benson, President
February 15, 2013

Contact Information:

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Name of Institution: College of Charleston

Designation: Program Planning Summary

Name of Degree: Bachelor of Arts, Bachelor of Science, Artium Baccalaureatus

Name of Program: Neuroscience

Number of credit hours in New Program: 51-67

Program qualifies for supplemental Palmetto Fellows Scholarship/LIFE Scholarship awards: Yes

CIP Code: 26.1501

Proposed date of implementation: Fall 2014

Justification of need for the proposed program:

In 2006, the College of Charleston launched an interdisciplinary Neuroscience program by offering students the opportunity to complete a minor. This program of study has been extremely popular with students and has approximately 100 undergraduates currently enrolled. In 2012 the program was recognized at the national level by winning one of only two awards given to undergraduate programs by the American Psychological Association Board of Educational Affairs. Based on our experience with the Neuroscience minor, we believe adding a major will increase interaction between students and faculty from different disciplines and provide an avenue for an enhanced partnership with MUSC (see attached letter). This program will produce graduates who can intelligently raise awareness of issues related to neuroscience in their future communities, regardless of their profession. Through this program, the College will continue as a leader in undergraduate neuroscience education and research.

The incidence of diseases or conditions involving the nervous system is increasing. Mental disorders and disease affect millions of people worldwide. In the U.S., 26.2% of adults suffer from a diagnosable mental disorder during any given year¹. Of these, 22.3% have a “severe” mental illness, such as schizophrenia, bipolar disorder, or panic disorder¹. Millions of people also suffer each year from disorders of the nervous system including Alzheimer’s disease, epilepsy, Parkinson’s disease, and spinal cord injuries. These disorders are likely to become more pervasive as the population continues to age. The National Institutes of Health recognizes the potential impact of neuroscience research on society in that 16 of the 27 institutes support neuroscience research. Quality training programs at the undergraduate level are required to prepare future scientists to meet these research needs and medical practitioners to address the impact on health care.

A growing number of institutions now offer programs in neuroscience as a result of widespread interest among students in brain/behavior relationships. While some South Carolina colleges and universities offer neuroscience-related courses, very few undergraduate neuroscience programs have been established in the state. The undergraduate Neuroscience major at the College of Charleston will be the *first* at a public institution in South Carolina. A similar degree was established at Furman in 2004, Wofford offers a joint major between Biology and Psychology, and USC offers a Neuroscience minor through its Biology department. Our program will complement the PhD Neuroscience program offered at MUSC.

The Neuroscience program at the College will be distinguished by: 1) cross-disciplinary learning opportunities consistent with the liberal arts and sciences mission of the College; 2) inclusion of a strong computational neuroscience component; and 3) a rigorous curriculum that includes a two-semester research component (at the College and/or MUSC) and a neuroscience capstone seminar designed to better prepare students for the expanding biotechnology job market in South Carolina and for science related graduate programs.

¹ National Institute of Mental Health, <http://www.nimh.nih.gov/statistics/index.shtml>

We anticipate continuing robust curricular and programmatic connections among the departments of Biology, Physics, and Psychology. These departments provide the core curriculum of the Neuroscience program and are strongly invested in its success. Due to the strong interdisciplinary nature of neuroscience, the curriculum will also draw from other areas such as Data Science, Computer Science, Anthropology, Philosophy, and Chemistry. The major will serve students entering academic and professional careers in the life sciences and medicine. Graduates with a minor in Neuroscience (56 since 2008) have gone on to medical school (15), graduate school (8), and been hired as research technicians (14). By creating a major program of study, our students will become even *more* prepared and competitive for these highly sought after positions and programs.

Program demand and productivity:

The development of a Neuroscience major is a natural extension to our thriving Neuroscience minor (<http://blogs.cofc.edu/neuroscience>). Presently, there are 100 declared Neuroscience minors with about 20 students completing the program each year. In senior surveys conducted over the past five years (46 respondents), 93% of graduates indicated they would have majored in Neuroscience if it was available as an option. An online survey (2010) administered to students in the School of Science and Math or Humanities and Social Sciences demonstrates strong interest in the Neuroscience program: 90/110 individuals indicated an interest in pursuing either a major (63 students, 57%) or minor (83 students, 75%) in Neuroscience. The current minor is very rigorous and approaches the level of coursework required in many majors at the College. Thus, we anticipate students interested in the current minor are representative of those students who would choose to pursue a major. An added benefit to offering a Neuroscience major is that we can modify our minor curriculum to appeal to students outside of the sciences and anticipate additional interest in the minor from Philosophy, Anthropology, Business, and Political Science.

Employment Opportunities for Graduates

Neuroscience research continues to be a primary funding focus of federal grants and creates extensive employment opportunities for scientists at all levels of education. Of the 56 students completing the minor, 14 were hired immediately after graduation as research technicians in neuroscience laboratories (e.g. Stanford, Harvard, MUSC, and Wake Forest University). According to the Bay Area Council 2012², the employment rate for STEM occupations is on the rise, especially in South Carolina where Charleston is ranked 5th and Columbia 2nd for high tech employment growth among the Top 25 metro areas. This program will help to generate highly trained graduates that will be well suited to move directly into these positions.

Outline of the Curriculum

The proposed major will consist of 67+ credit hours for the BS, 51+ credit hours for the BA. The curriculum is designed to comply with competency guidelines put forth by the Faculty for Undergraduate Neuroscience and Project Kaleidoscope as benchmarks for an undergraduate education in neuroscience³. Our program includes a strong background in natural science (1 year of Biology, Chemistry and/or Physics), psychological principles (Introduction to Psychology), and experimental/mathematical concepts (calculus and statistics). A nine credit hour core curriculum requires an introductory neuroscience course and two courses in advanced neuroscience. The breadth of the curriculum draws from 12+ credit hours of electives which allow for students to choose from a

² Bay Area Council Economic Institute (2012) Technology Works: High-tech employment and wages in the United States; www.bayareaeconomy.org

³ Wiertelak, EP and JJ Ramirez (2008) Undergraduate Neuroscience Education: Blueprints for the 21st Century, The Journal of Undergraduate Neuroscience Education 6(2):A34-A39.

diversity of liberal arts courses that will strengthen the interdisciplinary nature of the major. High impact learning is a focus of the senior year when students engage in two semesters of independent research (internship) and a capstone seminar. These courses will serve to develop skills in critical thinking, ethics, and communication.

CORE NEUROSCIENCE COURSES:

PSYC214 Behavioral Neuroscience, NSCI351 Principles of Neurobiology, NSCI352 Neurobiology and Behavior

ELECTIVES (12+ hours from approved course offerings from the following departments)

Psychology, Biology, Physics, Anthropology, Chemistry, Computer Science, Data Science, Philosophy, Physics

HIGH IMPACT LEARNING EXPERIENCES (research internship and capstone)

NSCI448 Bachelor's Essay in Neuroscience (required for BS), NSCI447 Capstone Seminar in Neuroscience (required for BS) or Senior Seminar (required for BA)

Articulation and Inter-institutional Cooperation:

The current Neuroscience program has developed a strong internship program with MUSC. Students in the current Neuroscience minor are required to conduct a year of laboratory research. The internship can be carried out in a neuroscience research lab at either the College or MUSC. MUSC's Department of Neuroscience has been instrumental in the success of this curricular component. In the future, this research requirement will be required only in the BS curriculum. We will continue to rely on MUSC to make these opportunities available to students. Additionally, we provide opportunities for MUSC faculty and post-doctoral fellows to integrate their teaching and research interests in our program as guest lecturers. With support from a Howard Hughes Medical Institute (HHMI) grant, MUSC graduate students have worked as teaching assistants (Teacher Training Fellows) in core courses associated with the program providing each with valuable undergraduate teaching-related experience not available in their doctoral program at MUSC. Additionally, we have developed service learning and community outreach partnerships between our two institutions exposing over 4000 pK-12 students to neuroscience over the past 4 years.

Estimate of Costs

The BA/BS programs will continue to be housed jointly in the School of Humanities and Social Sciences (HSS) and the School of Science and Math (SSM). Thus, existing resources are available to support the program. No additional facilities, technology or physical infrastructure will be required to add a major to the existing Neuroscience minor program. As the program grows, we anticipate hiring one additional tenure-track faculty (in Psychology), a part-time administrative assistant, and appointing a faculty director to coordinate the program. Resources for these additions have been included in future budget models in the host schools. The institution further commits to covering the modest costs associated with a recurring library fund for journals and books, an operating budget for student research and community outreach activities, as well as the costs associated with continuing the MUSC Teacher Training Fellows partnership (currently supported by HHMI funds).