

Department/Program: Neuroscience

Chair/Director: Adam Hall

Retreat Date: August 25th, 2008

Departmental/program faculty in attendance:

Margaret Anderson
Virginia Hayssen
David Bickar
Beth Powell
Richard Olivo
Michael Barresi
Mary Harrington
Stan Scordilis
Adam Hall

Introduction

A flourishing Neuroscience program is an integral part of Smith College's science curriculum. The Neuroscience major was first offered in 1997 and is now the 12th largest major at the college and the 3rd largest major in science and engineering. We aim to provide our students with a strong foundation in current concepts in neuroscience, the intellectual tools that will permit them to continue to learn long after they graduate, and an appreciation for the experimental acumen and rigor necessary to gain new knowledge in the field.

How do your plans advance departmental goals as outlined in mid-term or decennial reports?

Our conversations were focused around the Neuroscience Program decennial report of 2000. As the number of majors has increased, we have increased the number of courses offered, and worked continuously to enhance the cohesiveness of our curriculum. Two new courses, Experimental Methods (an intermediate-level laboratory-based course, NSC 200) and Cellular and Molecular Neuroscience (an advanced-level course with accompanying laboratory, BIO 310/311) are now well-established and consistently enjoy full enrollment. All majors are required to take Experimental Methods and two out of four advanced-level courses, all of which include a laboratory component. Our major also requires students to enroll in a seminar course or a course involving independent research. The goal underlying the organization of the major is to give our students experiences that illustrate the ways in which scientific knowledge is expanded. They are given opportunities to engage in hands-on laboratory work (including designing experiments), to read and assess articles from the original literature (an exercise that typically requires quantitative reasoning), write research-based papers, and make oral presentations. At the retreat, we agreed that these experiences have helped our students become scientifically literate and develop quantitative skills.

Furthermore, we have recently included a course in statistics (MTH 190 or 245) as required for the major. This requirement has formalized our hortatory emphasis on the importance of quantitative courses, and assures that neuroscience students are better versed in data analysis and interpretation. We have also increased opportunities for students to explore Cognitive Neuroscience through the introduction of a Five College Certificate in Cognitive Neuroscience. This certificate reflects the growing impact of this field within the academy as well as society at large. This initiative included the development of a new course in Cognitive Neuroscience (MJ Wraga). MJ plans to develop another 300-level research methods course in Cognitive Neuroscience, which will be offered every other spring. This course will provide students with hands-on experience in cognitive neuroscience methodologies, including neuroimaging techniques.

How does the departmental/program plan to integrate the list of intellectual capacities into the major? For instance, are specific capacities such as writing, speaking or quantitative skills developed in particular courses, or a series of courses?

We considered that the neuroscience program already incorporates writing, quantitative, and oral presentation skills throughout the major. Experimental Methods in Neuroscience (NSC 230) was designed to train students in writing skills using appropriate scientific formats. This course also develops data acquisition, data analysis and handling abilities. All of the 300-level laboratories require students to obtain, analyze, present quantitative data and subsequently describe and critically evaluate their findings. As mentioned above, we now require students to take MTH 190 or 245 due to the increasing importance of handling large datasets in neuroscience research. In seminars and 300-level lecture courses, students write term papers based upon reading and research of primary literature and share their knowledge with the class through presentations and class discussions. Also, students are required to present findings from their independent projects in 300-level laboratories which also improves to public speaking skills. Finally, students researching with neuroscience faculty have typically traveled to national and international meetings to present their findings. Thus, capacities in writing, speaking and quantitative skills are already strongly encouraged and developed.

Of the specific curricular goals identified by the faculty which would be furthered within the major? (see page 8 of the Smith catalog for further examples)

- I. Develop the ability to think critically and analytically and to convey knowledge and understanding**
- II. Develop historical and comparative perspectives**
- III. Become an informed global citizen**

We considered the Neuroscience major to address all these goals. As described above, there are many courses and research opportunities in the major (NSC 230, and 300-level offerings, Special studies and Honors) that require critical and analytical thinking and the

chance for students to present their work in class, at internal symposia or even at national and international meetings

Neuroscience is fundamentally interdisciplinary and draws on multiple disciplines to answer relevant questions. Thus, the teaching of neuroscience requires a comparative approach as exemplified by behavioral, neuroanatomical and neurochemical techniques taught in NSC 230.

Seminal studies within the field of neuroscience are covered in NSC 230 and in the upper level seminars to encourage a historical perspective and knowledge of landmarks in neuroscience.

Neuroscience impacts our lives in many ways from ethical issues surrounding brain imaging or use of memory enhancing drugs, through neurological disorders affecting both young and elderly, and even to designing environments conducive to better clinical outcomes or productivity. Our neuroscience students are strongly encouraged to place their knowledge in a global context. For instance, every class period in NSC 230 students are required to present a 'Current Issue in Neuroscience' that has recently appeared in the press. Beth Powell is currently teaching an upper-level seminar that explores ethics and policy in neuroscience. Although we have many students continue on to both graduate and medical schools, our neuroscience graduates have also included lawyers, public health administrators, financiers and even hotel managers.

Has the department integrated the development of student research abilities in the structure of the major? For instance, is there an information literacy program in place for students who major in the department? Is there a research methods course recommended for your majors (either in your department or another one)? If so, when in the student's career does she take this course?

Again, we all agreed that information literacy is encouraged at early stage of our major. Students are strongly advised to take NSC 230 (Experimental Methods in Neuroscience) in their sophomore year as this best prepares them for upper-level lecture and laboratory experiences. NSC 230 is offered both semesters and is required for the major. One component of the course involves library training with Rocco Piccinino in the Young library. The students are then required to research an article for class presentation, conduct literature searches to develop a hypothesis for their independent project work, and ultimately to draw up a reference list of articles directly related to their projects. Three of the 300-level laboratory offerings (Cell/Molecular Neuroscience, Neuroanatomy and Developmental Biology) have independent project components that require extensive library preparation and rely on information literacy developed in our methods course. For the fourth course (Neurophysiology), the students write essays based on a packet of journal article readings which then permits in-depth class discussion on their essay topics.

We have not as yet drawn up an Information Literacy Plan to be posted on our website. However this issue was discussed at the retreat and a plan will be forthcoming.

Are the pathways through the major clear for prospective majors? Is the department satisfied with the level of advanced work accomplished by its majors? (It may be useful to review the transcripts of graduating majors, or to examine the course taken patterns of several recent groups of senior majors.)

There is currently a clear trajectory through the Neuroscience major comprised of a set of core requirements, a sophomore methods course, a requirement for two 300-lecture/lab courses and elective courses that include seminars and independent research. The major offers depth in neuroscience, biology, chemistry and mathematics but has the flexibility to enable students to explore individual interests in developmental, cellular/molecular, systems and cognitive neuroscience.

As mentioned above, the program is exploring the idea of incorporating more opportunities for students in Cognitive Neuroscience at the advanced level. Currently students are required to take two of four 300- level lecture/lab classes. To date there has been no representation of cognitive neuroscience at this level. For Spring 2010, MJ Wraga is proposing to offer a Research Methods course in Cognitive Neuroscience (to be co-taught by Jane Couperous at Hampshire College). This will expand our advanced neuroscience offerings and give more comprehensive coverage at this level.

What are the culminating or capstone experiences for students in your major?

We have expanded our seminar offerings to include Seminars in Neuroscience (NSC312) in either 'General Anesthesia' (Adam Hall) or 'Biological Rhythms' (Mary Harrington), Seminar in Biopsychology (PSY 326, currently 'Neuroscience , Ethics and Policy': Beth Powell) and an option for a Seminar in Biochemistry (BCH 380, 'Biological bases of neurological disorders': Adam Hall) which can all be taken as electives.

For all seminars students are required to integrate information from multiple disciplines and to draw from their chemistry, biology, neuroscience and biochemistry backgrounds. In this way, students research a topic at multiple levels of analysis and are then expected to synthesize this information in term papers and class presentations. For instance in the 'Biological Bases of Neurological Disorders' seminar, students use multiple sources to explore and ultimately develop their own molecular models to explain outcomes of a chosen neurological disorder.

Please attach a summary of any proposed changes to be considered by the department and any associated timeline for changes to be submitted to CAP.

- MJ Wraga to develop a 300-level Research Methods course in Cognitive Neuroscience to give more comprehensive coverage at this level (Spring 2010)
- Explore the idea of offering a first year seminar in Neuroscience (2010?)
- Develop information literacy plan and post on website (J-Term, 2009)