

*Queens College of the City University of New York*

*Department of Psychology*

**Letter of Intent**

**For A New Program Proposal**

**For A**

**Masters Program in Behavioral  
Neuroscience**

**Program Implementation Target Date: September 1, 2009**

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## PURPOSE AND GOALS

**Goal:** To allow promising Masters graduate students to engage in intensive, research-based study within the field of Behavioral Neuroscience.

**Rationale:** The field of Neuroscience, and particularly Behavioral Neuroscience, has been growing steadily over the past few decades, exemplified by the national “Decade of the Brain” initiative and the rapid growth of the Society for Neuroscience from 500 members in 1970 to over 30,000 now. Many universities (approximately 70 nationwide) now offer undergraduate majors or Programs in Neuroscience, including New York University and Columbia University in New York City, and most recently in 2005, Queens College of the City University of New York (CUNY). Given the Psychology Department’s initial success in implementing the Undergraduate Neuroscience Major at Queens College, and given its long-time support and leadership of the campus-based Neuropsychology Doctoral Sub-Program, we propose to create a Masters Program in Behavioral Neuroscience within Psychology for the following reasons:

- 1) To provide some of our most promising undergraduates a continued opportunity to benefit educationally from the college’s unique expertise in this field of study (refer to faculty resources description presented later in the proposal).
- 2) To provide our Masters graduates in Behavioral Neuroscience greatly enhanced chances of being admitted into highly-competitive Doctoral Training Programs in Behavioral Neuroscience and other Neuroscience-related fields. This includes consideration and admittance into existing Neuroscience-related doctoral programs in Biology and Psychology at the CUNY Graduate School, and an anticipated free-standing Neuroscience Doctoral Program at CUNY.
- 3) To markedly increase the chances that our Masters graduates will be recruited for employment within the private sector as Research Assistants/Associates trained in the growing field of Neuroscience and Neuroscience-related fields.
- 4) To increase the availability of talented graduate students to conduct Neuroscience-related research within our laboratories in Psychology, thereby working to increase College- and University-driven goals to increase graduate education set by the CUNY Graduate Investment Initiative.
- 5) To encourage further interaction between the diverse Neuroscience laboratories from various Departments (e.g., Psychology, Biology, Computer Science, Anthropology, Chemistry/Biochemistry) across campus through the Neuroscience Research Center at Queens College. In the Psychology department’s last Self-Study evaluation, the evaluators emphasized the value of cross-departmental interaction.

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## NEED

Over the course of the past three decades, Neuroscience as a field has grown tremendously. Currently, there are many graduate and undergraduate Neuroscience Training Programs, and career opportunities for those with a Neuroscience background are growing in healthcare, academia, government, and the private sector. Currently, Queens College of CUNY has the only public undergraduate Neuroscience Program in New York City which, created in 2005, stands as one of the few public Neuroscience Programs in New York State. The creation of this Undergraduate Program thus satisfied the need for an affordable, high-quality program that provides research-based training in Neuroscience. The Undergraduate Program in Neuroscience also represents a focused track for aspiring physicians, therapists, nurse-specialists, clinical psychologists, and others to pursue (especially those interested in the fields of Neurology, Neurosurgery, or Psychiatry).

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Although the Undergraduate Neuroscience Program at Queens College (#7 Best Value College, 2007: Princeton Review; Top 15 Public Universities-Master's-North, 2008: US News and World Report) increases the competitiveness of those students interested in Doctoral Neuroscience training in the admissions process, the number of students accepted in Doctoral-level Neuroscience Programs typically affiliated with major medical schools still remains astonishingly small and highly competitive. Given the large influx of underrepresented, immigrant and first-generation undergraduates into Queens College in particular (Newsweek College Guide '08: Hottest for First-Generation Students, Queens College, CUNY), and public colleges in the New York in general, it is not uncommon for very strong candidates for post-graduate Doctoral education to secure further training and opportunities beyond the undergraduate degree.

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Although many of our undergraduate students, particularly those participating in the undergraduate Neuroscience major have been involved in laboratory research, many other students, from Queens and other schools that graduate from such traditional disciplines as Biology, Chemistry, and Psychology, often do not actively participate in laboratory research. By working productively in a research laboratory, the student is demonstrating a commitment of time and effort that Doctoral Admissions Committees consider extremely important. The student is learning first hand what laboratory research is all about, and if successful, will be a co-author of a paper presented at a research meeting and/or written for publication in a peer-reviewed scientific journal. Moreover, students from many other disciplines have typically taken a one-semester survey course in Behavioral Neuroscience, Neuroscience or Neurobiology. Further, many students, particularly in non-Psychology majors, have not taken courses in Experimental Design and Statistics, very important components for Doctoral study in Behavioral Neuroscience. Our proposal recognizes the need for training in courses that emphasize writing, especially technical writing. Far too many students apply to doctoral education with an adequate background in science courses but with almost no experience in the craft that is the hallmark of science. These three major components, laboratory research experience, multiple courses in Neuroscience and Behavioral Neuroscience, and didactic courses in

Experimental Design and Statistics, are the key features in satisfying the needs for strong and focused graduate, Masters-level training in Behavioral Neuroscience.

A Masters Program in Behavioral Neuroscience would be entirely compatible with other missions within the Department. The Psychology Department at Queens College has nineteen full-time faculty members on campus who presently participate in the campus-based CUNY Neuropsychology Doctoral Sub-Program, and as such, have fully-functioning and active laboratories on campus: Drs. Bodnar, Borod, Brumbaugh, Brumberg, Croll, Ehrlichman, Farrell, Fields, Flory, Foldi, Golub, Halperin, Johnson, Li, Pytte, Ranaldi, Sneed and Sturmey. Most of these laboratories are “vertically-organized”, that is, many at present have Doctoral, Masters and Undergraduate students working in the laboratory settings. Thus, the proposed Masters Program in Behavioral Neuroscience would actually facilitate the present structure of the Department’s academic mission in this area, creating a seamless transition among Undergraduate, Masters and Doctoral areas in Behavioral Neuroscience. Virtually all of these laboratories regularly publish peer-review articles in the Behavioral Neuroscience and related literature (153 publications in 2004-2006) and have research in the pipeline as evidenced by scientific presentations in the past year (90 presentations). The areas of academic interest in Behavioral Neuroscience are by definition very large in scope moving from cellular and molecular issues, through behavioral analyses using animal models, and through behavioral analyses using human subjects to clinical issues. The Department faculty is very well-positioned to provide detailed academic and laboratory training for Masters students in Behavioral Neuroscience interested in these four different levels of analysis: cellular and molecular issues (Drs. Brumberg, Croll, Pytte), behavioral analyses using animal models (Drs. Bodnar, Farrell, Ranaldi), behavioral analyses using human subjects (Drs. Brumbaugh, Ehrlichman, Fields, Golub, Johnson, Li) and clinical issues (Drs. Borod, Flory, Foldi, Halperin, Sneed, Sturmey). Most of the existing faculty have been the recipients of internal sources of funding (PSC/CUNY grants and more competitive CUNY Collaborative grants: Bodnar, Brumberg, Fields, Johnson, Ranaldi), and more importantly external sources of funding (NIH: Bodnar, Borod, Brumberg, Croll, Flory, Halperin, Li, Sneed; Alzheimer’s Association: Foldi). Therefore, the Department has the research infrastructure necessary to support a research-oriented Masters Program in Behavioral Neuroscience that will complement the existing Undergraduate Neuroscience Major and the existing Neuropsychology Doctoral Sub-Program. One major question is the need for a Masters Program in Behavioral Neuroscience relative to the two existing Masters Programs in Psychology: a General Masters Psychology Program and a Psychology Masters Program in Clinical and Behavioral Applications (CBA); this question will be addressed in the next section describing the students.

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## STUDENTS

The General Masters Psychology Program currently has 60 students in a 36-credit course of study, and the Psychology Masters Program in CBA currently has 40 students in a 48-credit course of study. Any impact that the proposed Masters Program in Behavioral Neuroscience would have upon the Psychology Masters Program in CBA would be minimal given the lack of overlap between the programs in terms of

coursework, outcome and goals. It should be noted that a companion proposal for a Psychology Masters Program in Applied Behavior Analysis would effectively supplant the present Psychology Masters Program in CBA as well as incorporate the Post-Baccalaureate Program in Applied Behavior Analysis at Queens College. Therefore, the important question will be the relationship between the General Masters Psychology Program and the proposed Masters Program in Behavioral Neuroscience; it is planned and anticipated that these two Programs will co-exist within the Department along with the revamped Psychology Masters Program in Applied Behavior Analysis.

The General Masters Psychology Program has and will continue to effectively serve the Psychology Department and its students. Over the past decade, the General Masters Psychology Program has had yearly enrollments ranging from 30-60 students, and has had an average graduation rate of 15 (range: 12-16) students. It should be noted that this graduation rate includes students who receive an en-route Masters Degree from the campus-based CUNY Doctoral Sub-Programs in Neuropsychology and Learning Processes-Behavior Analysis. One obvious outcome measure of success of a Masters Program is its graduation rate relative to the number of students who matriculate into the Program. However, given the fact that a Masters Program in almost any field of Psychology (save perhaps for Programs specifically licensed by NYS) is often not the terminal degree in the field, a second outcome measure of success of a Masters program is its effectiveness in allowing students to be successfully admitted into a Ph.D. Program before graduating from the Masters Program. When taking both of these factors into account, the General Masters Psychology Program at Queens College has been very successful accounting for 82% of the students who matriculated into the Ph. D. Program according to our most recent Psychology Self-Study performed in 2002. Not surprisingly, the General Masters Psychology Program at Queens has been an effective conduit for our two campus-based Doctoral Programs in two distinctive ways: a) serving as a platform for matriculating potential students at Queens who are close, but not ready for acceptance to the two Ph.D. Programs (so-called Masters Referred students), and b) attracting students who apply to the General Masters Psychology Program at Queens and then successfully matriculate to the two campus-based Doctoral Programs. Over the past five years, approximately 15 students who applied to the Neuropsychology Doctoral Sub-Program and approximately 9 students who applied to the Learning Processes-Behavior Analysis Sub-Program were referred to the General Masters Psychology Program at Queens. Of these, approximately 10 Neuropsychology and 8 Learning students matriculated with the end result that 7 Neuropsychology and 6 Learning students were eventually admitted to the respective Doctoral Programs with any credits accumulated in the MA Program going directly to the Ph.D. degree. Such “referred” students in the future would be admitted to the two proposed Masters Programs in Behavioral Neuroscience and Applied Behavior Analysis. In addition, 6 students who applied and gained admittance to the General Masters Psychology Program at Queens College were accepted to the Neuropsychology Doctoral Sub-Program, and 2 students using this route were accepted to the Learning Program. This latter cadre of students together with students who successfully graduate from the General Masters Psychology Program at Queens College offer ample reason for continuing and strongly supporting this very important feature of our educational mission.

Another major pool of prospective students for the proposed Masters Program in Behavioral Neuroscience would come from the undergraduate classes of Neuroscience majors at Queens College. Currently, there are 30 Neuroscience majors and the first graduating class in June, 2007 had 7 students, many of whom went on to post-graduate doctoral and medical education. A significant percentage of current students in this program has expressed interest in the proposed Masters Program in Behavioral Neuroscience because it gives them additional laboratory experience, as well as opportunities to publish and to give presentations, thereby increasing their chances to get into highly-competitive doctoral Neuroscience Programs.

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The third pool would of course come from outside applications. Typically, the Masters Program at Queens College receives approximately 40 applications with about 50% showing some degree of interest in Behavioral Neuroscience. The actual implementation of such a program will only increase the number of applications; we believe that it will be further enhanced if CUNY moves forward on creating a free-standing Doctoral Program in Neuroscience. The projected enrollment of the proposed MA Program in Behavioral Neuroscience follows.

**PROJECTED ENROLLMENT**

|                      | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|----------------------|--------|--------|--------|--------|--------|
| Projected Enrollment | 15     | 30     | 45     | 45     | 45     |

It is anticipated that most of the students who are admitted to the Masters Program in Behavioral Neuroscience will graduate from the Program successfully. Reasons that attrition could occur include: 1) the student successfully matriculates to a doctoral program in Neuroscience or a related field either within or outside CUNY; 2) the student fails to maintain a 3.0 GPA (see requirements below); 3) the student fails to complete their research thesis; or 4) the student changes academic or career goals.

Although some attrition can be expected for each of the reasons listed above, we expect this attrition to be minimal because of our admissions criteria. In order to apply, students must have shown some success in undergraduate Neuroscience-related coursework. The admissions criteria list other Psychology and related courses that are often fairly difficult “gateway” courses. As indicated above, we would consider successful matriculation to a doctoral program as an outcome indicator of success, and not of attrition in the strictest sense. Attrition will also be minimized by clearly indicating laboratory openings for the students so that they can maximize their research interests with available laboratory mentors. The size and scope of our faculty and their interests (see below) are very promising and positive indicators that the students’ interests and the laboratory experience will prove to be matches. The Head of the proposed Masters Program in Behavioral Neuroscience and the research mentor will meet each

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semester with the student to ensure that the student is meeting his or her academic and research goals.

### ADMISSIONS REQUIREMENTS

Minimum requirements for applying to the Masters Program in Behavioral Neuroscience are:

- (1) an undergraduate overall GPA greater than 3.00;
- (2) at least 15 credits of Undergraduate Psychology, Neuroscience or equivalent courses;
- (3) submitting scores on the General and Subject Graduate Record Examinations. Although a minimum score is not stipulated, the score will be taken into consideration relative to the other two criteria especially in terms of underrepresented groups in Behavioral Neuroscience.

Preferences in acceptance decisions for the Masters Program in Behavioral Neuroscience:

- 1) The undergraduate coursework includes courses in Behavioral Neuroscience and related fields like Neurobiology;
- 2) The undergraduate coursework includes courses in Statistics, Experimental Psychology, relevant laboratory courses, or Research Design;
- 3) The student has undergraduate research experience in a Behavioral Neuroscience or Neuroscience-related laboratory.

Applications for the Masters Program in Behavioral Neuroscience will be reviewed in the Spring semester of a given year for acceptance in the Fall semester of the same year. Applications will be available through the Graduate Admissions Office at Queens College and will also be downloadable from the Psychology Department Web Page.

### CURRICULUM

#### PROPOSED MASTERS DEGREE PROGRAM IN BEHAVIORAL NEUROSCIENCE

The 37-credit Program consists of 15 credits of highly-specific Basic Neuroscience courses that give the student the requisite background of the field, 7 credits of Experimental Design, **Statistics** and Ethics to familiarize the student with research design, quantitative analyses of data and ethical issues related to animal and human research, 6 credits of original research designed and carried out by the student in consultation with a mentor, and 9 credits of electives to allow broadening of the area that the student chooses:

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**A) 15 credits in required Basic Neuroscience** (Psych 708.1, 708.2, 708.3) and **Advanced Physiological Psychology** (Psych 710, 711) courses;

**B) 7 credits in required Experimental Research Design** (Psych 703.1), **Statistics** (Psych 705) and **Ethics** (Psych 771.1) courses;

**C) 6 credits of required Thesis Research** (Psych 791.3, 792.3); A Masters Thesis defense will consist of a public presentation and a written document approved by the mentor and at least one other reader appointed by the MA Advisor.

**D) 9 credits in elective courses** (see below).

**It should be noted that** all of the courses in the proposed Masters Program in Behavioral Neuroscience are and have been taught at Queens College over the past 25 years. The suggested sequence of these courses follows.

### **Timeline for Proposed Masters in Behavioral Neuroscience Curriculum**

#### **Fall Semester I**

Psych 705: Statistics I (3)  
Psych 708.1: Basic Neuroscience: Neuroanatomy (3)  
Psych 708.2: Basic Neuroscience: Neurophysiology (3)  
Join Laboratory  
Elective (3) or 9 credits taken

#### **Spring Semester II**

Psych 703.1: Research Design (3)  
Psych 708.3: Basic Neuroscience: Psychopharmacology (3)  
Psych 710: Advanced Physiological Psychology I (3)  
Psych 791.3: MA Thesis Research I (3)

#### **Fall Semester III**

Psych 711: Advanced Physiological Psychology II (3)  
Psych 791.3: MA Thesis Research II (3)  
Psych771.1 Ethics in Psychology (3)  
Electives (3) or 7 to 10 credits

#### **Spring Semester IV**

(if 37 completed, nothing; otherwise the electives).

#### **List of Behavioral Neuroscience Electives:**

Psych 700: History of Psychology (3)  
Psych 735: Perception (3)  
Psych 738: Cognition (3)  
Psych 755: Psychopathology (3)  
Psych 760: Psychometrics (3)  
Psych 791: Comparative Psychology (3)  
Psych 817: Survey of Clinical Neuropsychology (3)  
Bio 700.3: Molecular Genetics (3)  
Bio 714.1: Cell Biology (3)  
Bio 722.1: Endocrinology (3)  
Bio 726.3: Comparative Animal Physiology (3)  
Bio 750.3: Developmental Biology (3)

### **FACULTY**



**Faculty Resources:** Queens College houses the CUNY Doctoral Subprogram in Neuropsychology (Psychology) and has multiple faculty members in the Neuroscience Doctoral Subprogram (Biology). Because of this combination, Queens College has an enriched presence of faculty members with interests and expertise within various areas of Neuroscience. In addition, because these faculty members are usually involved in graduate training, each has an active research laboratory. Our collective strength in this field puts us in a unique position to immediately implement the proposed Masters Program in Behavioral Neuroscience. No additional faculty will be necessary to initiate this Program. As indicated earlier, the Department faculty is very well-positioned to provide detailed academic and laboratory training for Masters students in Behavioral Neuroscience interested in four different levels of analysis: cellular and molecular issues (Drs. Brumberg, Croll, Pytte), behavioral analyses using animal models (Drs. Bodnar, Farrell, Ranaldi), behavioral analyses using human subjects (Drs. Brumbaugh, Ehrlichman, Fields, Golub, Johnson, Li) and clinical issues (Drs. Borod, Flory, Foldi, Halperin, Sneed, Sturmey). Most of the existing faculty have been the recipients of internal sources of funding (PSC/CUNY grants and more competitive CUNY Collaborative grants: Bodnar, Brumberg, Fields, Johnson, Ranaldi), and more importantly external sources of funding (NIH: Bodnar, Borod, Brumberg, Croll, Flory, Halperin, Li, Sneed; Alzheimer’s Association: Foldi). Further, we have a diverse representation of Neuroscience in other departments on our campus, including Biology, Biochemistry, Computer Science, Anthropology, and Fitness, Nutrition, and Exercise Sciences (FNES) who can serve as potential mentors for Masters thesis research.

Courses required of the Masters Program in Behavioral Neuroscience students are pre-existing courses already listed on the schedule, and taught by our full-time Psychology faculty members. Therefore, we do not anticipate that the Program will interfere with current course offerings or faculty assignments in either the Psychology or Biology Department. Should the Program grow beyond our predictions, or attract large numbers of additional students to the college and Program, future investments in Neuroscience Faculty lines might become necessary. Because admission to the Program is by application, we have the ability to maintain a fixed number of students, regardless of number of applications; however it would be preferable to have the ability to expand the size of the Program should student interest exceed current Program capabilities. This would be accomplished through implementation of faculty lines hired through the CUNY Graduate Investment Initiative. Thus, the cost assessment would be primarily for administrative time of our faculty and secretarial staff.

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**COST ASSESSMENT**

| Category                      | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|-------------------------------|--------|--------|--------|--------|--------|
| Faculty Lines                 | \$0    | \$0    | \$0    | \$0    | \$0    |
| Administrative Time (faculty) | 360h   | 360h   | 360h   | 360h   | 360h   |

Faculty members are very enthusiastic about this curriculum, and it was approved by the Psychology Department faculty.

**ADMINISTRATIVE COMPONENTS**

| Activity                  | Number of Faculty | Estimated hrs per faculty per year | Estimated total faculty hours |
|---------------------------|-------------------|------------------------------------|-------------------------------|
| Admissions Committee      | 5                 | 6                                  | 30                            |
| Student Presentations     | 15                | 4                                  | 60                            |
| Advisement/Administration | 2                 | 40                                 | 80                            |
| Website Updates           | 1                 | 10                                 | 10                            |

**Supplies** – It is anticipated that \$500 per year will be necessary for making copies of flyers describing the Program and applications for admission. Although copies of the application will be made available via the home page for the Program, some students may prefer to pick up application materials in the Psychology Department.