



NYU/CNS

Center for Neural Science

**HANDBOOK OF THE DOCTORAL
PROGRAM IN NEURAL SCIENCE**

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PROGRAM IN NEURAL SCIENCE**

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TABLE OF CONTENTS

I. DESCRIPTION OF THE DOCTORAL PROGRAM	1
A. UNIVERSITY REQUIREMENTS	1
B. OVERVIEW OF THE DOCTORAL PROGRAM IN NEURAL SCIENCE	1
D. COURSES.	3
E. RESEARCH	5
F. FELLOWS' SEMINAR	6
G. ADVISORY COMMITTEES.....	6
H. EXAMINATIONS.	7
I. STUDENT EVALUATIONS.....	7
J. TEACHING	8
K. PRESENTATION OF RESEARCH PAPERS AT SCIENTIFIC MEETINGS	8
L. FOREIGN LANGUAGE.....	8
M. TIME LIMIT IN THE PROGRAM.....	9
N. TRANSFER OF CREDITS	9
O. POLICY ON TRANSFER FROM OTHER DEPARTMENTS IN GSAS.....	9
P. INTER-UNIVERSITY CONSORTIUM	10
Q. OTHER ACTIVITIES OF INTEREST.....	10
II. THE DOCTORAL DISSERTATION	11
III. FACILITIES	17
A. TECHNICAL FACILITIES	17
B. SHARED RESEARCH FACILITIES.....	17
C. COMPUTERS.....	18
D. ANIMAL FACILITY	18
E. HUGHES TEACHING LABORATORY.....	18
F. CENTER FOR NEURAL SCIENCE OFFICE	19
G. CENTER FOR NEURAL SCIENCE LIBRARY	19
H. NYU LIBRARIES	19
IV. GENERAL INFORMATION	20
A. FINANCIAL AID.	20
B. STIPENDS AND INCOME TAXES.....	20
C. ID CARD AND KEYS.....	21
D. HOUSING	22
E. ELECTRONIC MAIL.....	21
F. MAIL	21
G. TELEPHONES	22
H. PHOTOCOPYING	22
V. INVENTORY OF GRADUATE COURSES	23

I. DESCRIPTION OF THE DOCTORAL PROGRAM

A. University Requirements

The course requirement for the Ph.D. at New York University is 72 points, the equivalent of 24 one-semester, three-point courses. Note that the Graduate School of Arts & Science requires that at least 30 of these points have a grade of B (not B-) or better and that an overall average of at least B is required to remain in good standing. CNS has additional requirements beyond the minimum standards set by the University. For more details on the University requirements, visit the GSAS website

<http://www.nyu.edu/gsas/AboutGSAS/index.html>

or the Bulletin of the Graduate School of Arts and Science

<http://www.nyu.edu/gsas/Programs/Bulletin/>

B. Overview of the Doctoral Program in Neural Science

The curriculum is designed to provide research training of high caliber to a small group of full-time students with varied backgrounds and interests. At least 37 of the 72 points required for the degree must be taken in graded courses. In the first year, students will take a 28-point core curriculum, described below. After the first year, each student will pursue a flexible curriculum that permits planning of courses and research opportunities to meet the student's needs, interests, and abilities. To meet the 37 graded point requirement, three additional graded 3-point courses will ordinarily be taken beyond the core curriculum. The Director of Graduate Studies will meet with each student during the first semester of graduate study to explore the student's interests and background. Together, they will select a committee of three faculty members who (with their approval) will guide the student in selection of laboratory rotations and who will be available for consultation. The committee will meet formally with the student at least once per semester.

C. Ph.D. Course Requirements:

A minimum of 72 points is required; at least 32 of which must be taken in residence at New York University.

For students who began the program in September 2000 or later, at least 37 points must be taken in graded courses. The first year core curriculum, required of all students, includes the following graded courses: Cellular, Molecular & Developmental Neural Science, G80.2201; Sensory & Motor

Systems, G80.2202; Cognitive & Behavioral Neural Science, G80.2205; Mathematical Tools for Neural Science, G80.2221; Laboratory in Neural Science I & II G80.2203 & 2204; and Introduction to Research in Neural Science I, II G80.2210, 2211.

For students who began the program in September 1999, at least 35 points must be taken in graded courses. The first year core curriculum, required of all students, includes Neural Science I, II G80.2201, 2202 (graded), Laboratory in Neural Science I, II G80.2203, 2204 (graded), Introduction to Research in Neural Science I, II G80.2210, 2211 (graded) and Seminar in Current Topics G80.3390 (Pass/Fail). In addition, students who entered in 1999 are expected to take two new graded courses, G80.2221, Mathematical Tools for Neural Science and G80.2205, Cognitive and Behavioral Neural Science, during the second year.

For students who began the program in September 1998 or earlier, at least 32 points must be taken in graded courses. These courses include the required first-year core curriculum: Neural Science I, II G80.2201, 2202 (graded), Laboratory in Neural Science I, II G80.2203, 2204 (graded), Introduction to Research in Neural Science I, II G80.2210, 2211 (nongraded) and Seminar in Current Topics G80.3390 (non-graded).

Note that second and third year students ordinarily register for up to 9 points per semester, including graded and non-graded credits. Students in the fourth year and beyond ordinarily register only for the courses needed to meet the 72 points required for graduation. Students must complete their graded credits before reaching 72 points.

Students who have earned 72 points "maintain matriculation. That is, they maintain registration as full-time students without registering for courses. CNS students may maintain matriculation without charge for six semesters. Thereafter, fees may be charged.

"Introduction to Research" course should be taken only by students who are doing rotations. Once you are attached to a laboratory, these courses are inappropriate.

The courses "Readings in Neural Science" and "Research Problems in Neural Science" are intended to provide appropriate course credits for the faculty-guided readings and research necessary for preparation of the PhD thesis. These courses can be taken more than once for credit.

"Dissertation Research" courses should be taken only by students who have completed about 66 points and the required number of points in

graded courses. These courses are ordinarily taken by students who are preparing the thesis document.

It is expected that the student will fulfill the course requirements, complete the doctoral research, and defend the thesis within five years.

D. Courses.

First Year: The Core Curriculum.

G80.2201. **Cellular, Molecular and Developmental Neural Science.** 4 points. A team-taught Fall semester proseminar that meets twice a week.

G80.2202. **Sensory and Motor Systems.** 4 points. A team-taught Spring semester proseminar that meets twice a week.

G80.2203, G80.2204. **Laboratory in Neural Science I, II.** 3 points per semester. A team-taught course that meets once weekly for 6 hours. Students receive hands-on training in the techniques of modern neuroscience in a laboratory with outstanding facilities for topical experimentation in neurophysiology and biophysics, neurochemistry, experimental neuroanatomy and behavioral neuroscience.

G80.2205. **Cognitive and Behavioral Neural Science.** 4 points. A team-taught Spring semester proseminar that meets twice a week.

G80.2210, G80.2211. **Introduction to Research.** 3 points per semester. This is the research component of the first year core curriculum in Neural Science. Students are required to do research in two different CNS laboratories during the first year of graduate study. The rotations expose the students to current questions and techniques in neuroscience; in addition, they become acquainted with research in the Center's laboratories, and can make more knowledgeable choices of research area and Advisor.

The first laboratory rotation begins in October and lasts until the end of the academic year in May. Students will ordinarily spend most afternoons (at least 15 hours per week) in this laboratory during the academic year. The second rotation begins in June and lasts through the end of August. This rotation will ordinarily involve a full-time commitment during the summer.

Students' performance will be evaluated on the basis of their learning the literature and their proficiency in lab techniques, through oral and/or written presentations within the lab group. In addition, during September or early October, at special seminars open to CNS faculty and students, students entering the 2nd year will give brief talks. Each presentation will be a description of research completed during one first year rotation. Under extraordinary circumstances, a student may be permitted to work in a single laboratory for the entire year, from October through August. In no case will this be permitted if the rotation is in the same laboratory in which the student will do PhD thesis research.

G80.2221. **Mathematical Tools for Neural Science.** A team-taught Fall semester course that meets that meets twice a week.

G80.3390. **Seminar in Current Topics.** 2 points per semester. A weekly one-hour research colloquium at which major research developments are presented by speakers from other institutions in the US and abroad. The colloquium meets at the Center for Neural Science and at NYU Medical Center on alternate weeks. Trainees of the Center are hosts for lunch (paid for by the Center) with the speaker when the seminar meets at the Center. Faculty does not attend the lunches.

Second and Later Years.

After the first year, the student's program is individually tailored to take maximum advantage of course offerings in areas relevant to the student's selected areas of interest. Students normally take three courses each semester: one or two content courses and one or two reading or research courses or the Seminar in Current Topics. Because of the specialized and selective nature of the training, classes are usually small. In addition to advanced seminars offered by members of the Center in areas of their own research, doctoral course offerings are available in the departments of Basic Medical Sciences, Biology, Chemistry, Computer Science, Mathematics, Physics, and Psychology. Students may also take courses offered at other Universities in New York City through the Inter-University Consortium (see Section P). Together, a rich and advanced curriculum in all areas of neuroscience and its cognate sciences is available. Finally, up to 12 credits (4 courses) may be obtained for Dissertation research.

Scientific Integrity.

All students participate in a workshop on scientific integrity and ethics of research. This is typically completed during the first year at CNS.

<http://www.cns.nyu.edu/emergsci/>

E. Research

First year: Ordinarily, research during the first year will be limited to projects carried out as part of the laboratory rotations. On occasion, the research project during a rotation is productive and leads to a more extended project.

Second Year: During the second year, students will usually have selected an area of primary research interest, and a faculty member whose research interests are closest to the student's own. This may or may not be the result of experience in the lab during a rotation, and the faculty member may or may not have been a member of the student's advisory committee. In a few meetings it should be possible to determine if there is sufficient mutual interest for a particular faculty member to serve as the research advisor. It is a good idea to talk with the advisor's current students and to get their perspective on the lab.

Second Year Paper. At the end of the second year, students will submit a research proposal to their advisory committee, which contains a literature review, documents progress and lays out a tentative protocol for future experiments. Copies should be submitted to each member of the committee and one to the Director of Graduate Studies. Students are strongly encouraged to base the proposal on pilot data, where possible. The proposals have, in the past, been about 15 single-spaced pages in length, using the format of NIMH pre-doctoral fellowship applications. The form of the paper should be suitable for submission as a fellowship or small research grant proposal; students are encouraged to seek independent funding for their research training. The second year paper is not a thesis proposal, which would more reasonably be expected toward the end of the third year.

Dissertation Proposal. In the third or fourth year, it is expected that each student will have sufficiently clarified his or her interests to be able to formally propose a dissertation project. The proposal will normally include pilot data and reflect a mastery of the conceptual and methodological basis of the problem. The proposal should be presented in both written and oral form to the dissertation committee. This committee replaces the student's faculty advisory committee and is comprised of three persons, all of whom are expert in some aspect of the proposed work (see Section G).

Fourth and Later Years: During the fourth or fifth year, it is expected that the dissertation will be completed. GSAS procedures for submission of the dissertation are described in the publication, *You and Your Doctoral Dissertation: A Guide*.

Research Talks. (1) In September, students entering the 2nd year give brief talks based on research completed during one of the first year rotations. (2) Third year students give 30-min talks, based on current research, during the Spring Fellows' Seminar series (see below). (3) Students in the final year give one-hour talks based on the dissertation. Ordinarily, the thesis defense occurs shortly before or soon after the talk.

F. Fellows' Seminar

This is a monthly one-hour meeting at which postdoctoral fellows of the Center present their research to the CNS community. Third year pre-doctoral presentations and PhD thesis talks are also given at the Fellows' Seminar. The seminars are well attended by faculty, postdoctoral fellows and students, and are followed by a reception for the speakers.

<http://www.cns.nyu.edu/fellowssem/>

G. Advisory Committees

Toward the end of the first year, the student, in consultation with the Director of Graduate Studies, will form a committee of three faculty members who will guide the student through the initial stages of the program. The student should meet with the committee at least once per semester.

The membership of the advisory committee will reflect the student's emerging scientific interests, and will serve to further guide the student in the selection of courses, and to discuss research goals and progress until the thesis proposal has been prepared. This committee will ordinarily consist of three members of the Center, including at least one member of the core faculty. *The chair of faculty advisory committees is always someone other than the research advisor.* It is the responsibility of the committee to see to it that the educational mission of the Center is served, while preserving flexibility in the program of study. The advisory committee reports on the student's progress (courses, grades, research) to the Director of Graduate Studies and to the faculty at large.

After a research direction has been established, typically toward the end of the second year, the committee is modified to include faculty members

whose research interests are most appropriate to help the student in the planning and execution of the research. Often several members of the advisory committee continue to serve on the dissertation committee, but this need not be the case. Members can be replaced or added at need, as the dissertation project develops and evolves to completion. All student committees must include at least one core member of the Center.

H. Examinations.

Qualifying Examinations. The student's general knowledge of the field of neuroscience is documented by satisfactory performance in the first year core curriculum, which is team-taught by the faculty of the Center. Examinations in the core courses comprehensively assess the student's knowledge of neuroscience, and also serve as the qualifying examinations for the Ph.D. degree. Grades of B+ or higher in core courses are required. In the event that a student has the core curriculum, or some portion of it, waived (as in the case of a student having a comparable course sequence elsewhere), they must take and pass a qualifying exam prepared by the faculty to satisfy this requirement.

Thesis Proposal. Once the student's dissertation focus is clarified, a dissertation proposal should be prepared. Specific knowledge related to the area of the doctoral thesis is examined orally during evaluation of the thesis proposal by the dissertation committee.

Final Examination. The final examination is the oral defense of the thesis. The examining committee usually consists of the three members of the dissertation committee plus two additional members, chosen by the student in consultation with the dissertation committee members and the Director of Graduate studies. One of the additional members is often an invited expert from outside of the University. Passage of the thesis defense is contingent on at least all but one of the examiners voting to accept the thesis and its defense.

I. Student Evaluations

The faculty meets annually to evaluate the progress of students. Satisfactory progress is based upon performance in courses and in the laboratory. Students should keep their committees informed of their activities, and make sure that the members of the committee and the Director of Graduate Studies are fully informed about completion of requirements (rotation talk, second year paper, third year talk, dissertation proposal, etc.) and other relevant scientific and professional

activities (attendance at summer courses, fellowship applications, papers given at meetings, publications, etc.).

Students should schedule a committee meeting at the end of each semester, and always before the faculty meeting on student evaluation. Shortly before the committee meeting the student should prepare an updated curriculum vitae, detailing the student's work and achievements.

Students whose performance is not satisfactory will be so advised and may be given notice of probationary status or eventually termination from the program.

J. Teaching

An important feature of the training program is participation as teaching assistants or adjunct instructors in the undergraduate and graduate course offerings of the Center for Neural Science. All students participate in a teaching/grading position for at least two semesters; ordinarily, this is done during one semester in each of the second and third years. Assignments are arranged through consultation with the Directors of Undergraduate and Graduate Studies in Neural Science, the faculty members responsible for the courses, and the preferences of the student.

K. Presentation of Research Papers at Scientific Meetings

The Center strongly encourages its students to present research papers at appropriate scientific meetings. Forums for such presentation include the annual meetings of the Society for Neuroscience, ARVO, and others. Ask your research Advisor about deadlines for submitting papers for various meetings. Some societies (e.g. Neuroscience) limit members to a single presentation, and it is recommended that students become members of such societies. Student membership in scientific societies is usually less expensive than is regular membership.

Although funds are limited, the Center encourages participation in scientific meetings, and either the Advisor or the Center will try to provide travel expenses for students who present papers at meetings. In addition, the Graduate School of Arts & Science provides partial support for travel to meetings at which students present papers. These funds must be applied for in a timely fashion.

L. Foreign Language

There is no foreign language requirement for the Ph.D. degree in Neural Science.

M. Time Limit in the Program

Students who have not made sufficient progress by the end of the sixth year may be terminated from the program unless the advisory or dissertation committee recommends an extension because of extraordinary circumstances. Students who have completed their seventh year of work without defending their dissertation will automatically be terminated from the program; again, unless the committee recommends an extension because of extraordinary circumstances. Terminated students may petition the faculty for readmission. (See the GSAS Bulletin for information about matriculation fees in such circumstances.)

Students with 72 credits may maintain full-time status for up to 3 years by filing the full-time equivalency form and paying an annual matriculation fee. Your status will automatically change to part-time after 3 years, at which time outstanding student loans at New York University or elsewhere become subject to payback requirements after a six-month grace period.

N. Transfer of Credits

Graduate course credit from other universities or departments may be used to fulfill some of the course requirements for the Ph.D. degree in Neural Science, provided that those credits were not used toward a degree in another program. *This does not apply to the Core Curriculum, which is ordinarily required of all students.* The student, in consultation with the advisory committee, should send a memo to the Director of Graduate Studies, requesting that credit be allowed for specific courses. If the advisory committee approves, credit will be allowed for courses appropriate to the student's education in Neural Science if the grade was at least B+, or equivalent. The memo must be accompanied by an official transcript and the official course description (usually a copy of pages from the catalog). If the description is not in English, a translation must be provided. Note that a minimum of 32 of the 72 credits required for the doctorate must be taken in residence at New York University.

O. Policy on Transfer from Other Departments in GSAS

Interdepartmental transfers to the Center will be considered only during the ordinary period of application for admission. Students in other departments who wish to apply should have documents currently on file

in the GSAS Office of Admissions sent to the Center for review by the Admissions Committee. The documentation should be supplemented by transcripts of work done at NYU since admission, and by two letters from faculty who are familiar with the student's current work. Because the Center can support only a limited number of students, it is anticipated that not all applicants for transfer will be accepted.

P. Inter-University Consortium

A group of universities in New York City have formed a Consortium for purposes of graduate education. Included are Columbia University, Fordham University, the Graduate Center of the City University of New York, the New School for Social Research, among others. Graduate students at any of these universities may take courses for credit at any other member university without tuition charges beyond those at the home university. <http://www.nyu.edu/gsas/Programs/IUDC.html>

Q. Other Activities of Interest

Other NYU Departments. Seminars that are often of interest to students in Neural Science are offered by the Departments of Biology, Psychology, Anthropology, Chemistry and Computer Science; and by NYU Medical Center. *Announcements are posted on the CNS Bulletin Board across from the elevators on the 8th Floor.*

Talks at Nearby Campuses. New York is a very rich neuroscience environment, and postdoctoral trainees often attend seminars at New York University School of Medicine, Cornell University Medical College, Rockefeller University, the Center for Neurobiology and Behavior at Columbia University, and Albert Einstein College of Medicine. Announcements are posted on the CNS Bulletin Board across from the elevators on the 8th Floor.

New York Academy of Sciences. 2 East 63rd Street. Student membership is relatively inexpensive. Members can attend monthly meetings of any of 20 sections, including Anthropology, Biological Science, Biomedical Sciences, Computer Science, Mathematics and Psychology. Membership includes free subscription to *The Sciences*, a monthly journal.

Check <http://www.cns.nyu.edu/events.php> for current information.

II. THE DOCTORAL DISSERTATION

Below is a brief outline of the technical regulations and procedures involved in completion of the dissertation. Also be sure to pick up the information sheets issued by the Degree and Diploma Office, Main Bldg., Room 7, which gives actual deadlines for an upcoming degree and lists the other forms you must file. The people in the Recording Office who are in charge of material for doctoral dissertations are Gloria Cobo (998-4865) and Agnes Thorton (998-4866). If you have any questions regarding format, extension of deadlines, computer typefaces, etc., please call them.

THE START

The Advisor

Sponsorship is a mutual agreement between the student and a member of the faculty. Advisors are not appointed; it is up to the student to find an appropriate Advisor, appropriate meaning a full-time member of the Neural Science Department faculty.

The Committee

You and your Advisor discuss the most appropriate faculty members for your thesis committee, usually the Advisor and two additional people. Either you or your Advisor should contact them to see if they are interested in your topic and are willing to serve as committee members. Once the committee is complete, inform the Director of Graduate Studies and the Graduate Administrator. Note: The chair of the committee is always someone other than the Advisor.

Committee members outside the Department. Sometimes it may be desirable for someone outside Neural Science, or even outside NYU, to be a member of your committee (i.e. special expertise, located where data will be collected, etc.).

If the person is in another department within the Graduates School of Arts and Science, approval by the Director of Graduate Studies may be given without having to clear it with the Dean's Office; a copy of the person's vita is not needed, but a statement regarding the area of special expertise must be included in the request.

If the person is not a member of the Graduate Faculty of GSAS, special approval must be given by the department chair and by the Graduate Curriculum Committee; a copy of that person's vita is needed, and a full statement of the need for inclusion on your committee and the special area of expertise.

All information should be submitted to the Graduate Administrator.

Proposal Meeting

Once the main committee has been formally established, the student should arrange to meet with the committee to review the dissertation proposal. If the proposal is approved, the chair of the Committee should inform the Graduate Administrator and Director of Graduate Studies.

THE MIDDLE

Regular Committee Meetings

While working on the dissertation, the student should meet with the 3member committee at least once each semester to review progress and to discuss problems which might have developed. This does not preclude more frequent meetings with the Advisor and/or other committee members, individually or as a group. It is the responsibility of the student and the Advisor to keep the committee informed on the development of the thesis work. It is strongly recommended that the committee be convened when :

- a) a considerable amount of time has elapsed (more than 6 months);
- b) any major problem arises in collecting data;
- c) any major problem in the results appears; or
- d) there is any major deviation from the plan outlined in the approved proposal.

THE FINAL STRETCH

Filing of Draft Copy of Dissertation and Necessary Forms

Approximately two months before the actual degree date (check with the Graduate Administrator for the exact date) you must submit the following to the Degree and Diploma Office:

- 1 A draft copy of the dissertation. This copy will be returned to you with a receipt, It can have paste-ons, written corrections, etc., and does not have to have the completed table of contents or reference list. For the typing format, see below.
- 2 Two unsigned copies of the title page. See the Format section below.
- 3 Two copies of the abstract. See the Format section below. The abstract can be revised later.

THE FINISH

The Readers

When you, your Advisor and the committee members unanimously agree that the dissertation is ready for defense, and approximately one month before you plan to schedule the oral defense, discuss with your Advisor who would be appropriate as readers. Keeping with the general rules stated above you and your Advisor should choose the two most appropriate people to read your thesis. If the Director of Graduate Studies approves the readers, either you or your Advisor should ask

them if they are willing to serve. When the two readers are agreed by all, send a memo to the Graduate Administrator.

If a proposed reader is not from NYU's Neural Science Department or from the Graduate School of Arts and Science in general, approval will be required. For people who are not members of the faculty of GSAS, you must obtain a copy of the person's vita and submit it to the Graduate Administrator, who will forward it to the Graduate Curriculum Committee for Approval. This approval should be obtained well in advance of the defense date.

The Oral Defense

Date. After readers have been approved, you arrange a convenient time for the oral defense and notify the Graduate Administrator of the date, time and place. Summer is a difficult time because many faculty members are away and those who are on campus may be involved in special projects. Try to schedule orals during the academic year.

Orals Package. The Graduate Administrator will prepare an "Orals Package" that contains the necessary forms for the committee members' signatures. The Orals Package may be picked up by the Advisor on the day of the orals and must be returned immediately after the orals.

(When you later submit the final, revised copy of the dissertation to the Graduate Administrator, you will be given the Orals Package to take to the Recording Office, with a copy of your final dissertation.)

The Defense. The dissertation and oral defense must both be approved by at least four of the five members of the examination committee.

Distribution of Dissertation Copies

For the oral defense you must distribute clean, legible copies of your dissertation to all five people at least two weeks before the date of your defense. Copies should be either in a black spring dissertation binder or other kind of binder that does not require punching holes but grips the pages firmly.

Final submission of degree material

When the final, revised dissertation is ready, incorporating all changes discussed at the defense, submit the following (the actual date that final degree material is due may be obtained from the Graduate Administrator):

To the Graduate Administrator: One copy of the final version in a black spring dissertation binder, with an original signature on the title page. This copy should be on bond paper, with good quality figures and photographs. It will be bound and will become part of the permanent thesis collection of the Center for Neural Science. Upon receiving the copy, the Graduate Administrator will give you the Orals Package to be taken to the Recording Office. If you owe maintenance of matriculation fees be sure to get the appropriate maintenance forms approved by the Graduate Administrator before proceeding to the next step.

The Orals Package given to you by the Graduate Administrator. Any outstanding fees (for microfilming, copyrighting; for library fines; or outstanding maintenance of matriculation fees). To pay maintenance fees you must get forms from the Graduate Administrator before proceeding to the Recording Office.

To the Recording Office. A clean original or photocopied version of the final, revised dissertation on bond paper, with an original signature from the Advisor on the title page; it must be in the black spring dissertation binder.

The Appropriate Approval Forms with the Advisor's signature. If any changes have been made in the abstract since the earlier filing, submit the final abstract, accompanied by the second title page with the original signature of the Advisor, and another pink approval form.

Format

The GSAS Office of Student Affairs has prepared a pamphlet that describes the format required for dissertations. Copies can be obtained at GSAS, One-Half Fifth Avenue.

Note: See GSAS Policies and Procedures manual for step-by-step information. <http://www.nyu.edu/gsas/OASL/gsasppm.pdf>

Summary of Approximate Deadlines

Check actual dates with Graduate Administrator or Recording Office

4 months prior to degree date: File diploma Card (Main, Rm. 7)
2 months prior to degree date: Submit draft dissertation and necessary forms to Degree & Diploma Office
1 month prior to degree date: Submit final degree material

III. FACILITIES

A. Technical Services

Electronics and Computer Hardware. The Center's shares certain services with the Departments of Psychology (Computer maintenance) and Physics (machine shop). The shops provides modern facilities for the development of specialized electronic, computer, and mechanical devices. Technical personnel in Neural Science include Kenneth Anderson, Computer Engineer; shop manager and WINDOWS specialist, Paul Fan, Systems manager, and UNIX/LINUX/OSX specialist; Peter Lau, Electronics Engineer, plus additional technical staff.

B. Shared Research Facilities

Neuroanatomy and Histology A fully equipped neuroanatomy and histology facility in Room 1055, supervised by Claudia Farb, Research Associate, includes several high quality research light microscopes, tissue-processing equipment, a Hacker-Breit microtome/cryostat, a vibratome, an ultramicrotome, -80° and -20° freezers, and the usual array of smaller equipment.

Darkroom. The Center has a fully equipped photographic and autoradiographic darkroom, under the technical supervision of Mian Hou.

Microscopy and Imaging. The department maintains an imaging facility in Rooms 975 and 977 that includes a Zeiss LSM-3 confocal microscope, a Eutectics Neuron Tracing System, a Neurolucida morphology analysis system and facilities for confocal and fluorescent microscopy. In addition, the facility includes equipment for scanning and slide making, a color laser printer and a large-scale printer for poster presentations.

Other shared facilities include an Inovision Calcium Imaging system in Room 1012 (Sanes Lab) and a JEOL electron microscope in Room 1056 (Aoki Lab). In addition, individual laboratories are fully equipped with modern instrumentation and computers, and provide facilities for advanced research in neuroscience.

MRI Lab. A Siemens Allegra 3-T MRI scanner is located on site. It is a shared facility dedicated to teaching and research in cognitive neuroscience. See <http://www.cbi.nyu.edu/> for more information.

C. Computers

A central computing facility based on an extensive network of Sun, Macintosh, and PC-compatible workstations and file servers provides broad access for CNS faculty and students to a modern network that supports sophisticated modeling, analysis and image processing software. Ethernet connections in all offices (including student offices) and laboratories simplifies the transfer of research data from laboratory minicomputers and microcomputer to the central system for analysis. The Center's computers are maintained by a highly competent staff of programmers including Paul Fan, Senior Systems Programmer, and the electronics engineer and technicians in the shared electronics shop.

D. Animal Facility

The vivarium provides suitable support personnel to assist researchers and students in animal research, including work with non-human primates. The facility is maintained in accordance with the strict regulations of the United States Public Health Service and Department of Agriculture, under the careful supervision of Dr. Carol Novotny, Director of the Office of Veterinary Resources. Students who work with animals must receive training in animal care and welfare procedures appropriate to the use of animals in scientific investigation.

<http://www.nyu.edu/uawc/>

E. Hughes Teaching Laboratory

Laboratory courses in Neural Science are taught in a facility constructed with the assistance of funds from the Howard Hughes Medical Institute. It is a high-quality environment for the laboratory teaching of modern neuroscience. A full-time laboratory assistant is responsible for supervision and maintenance of the facility.

The laboratory has five computer-based student workstations, a central teaching station for lectures and demonstrations, and a histology section. It provides the capabilities for modern topical experimentation in neurophysiology and biophysics, neurochemistry, experimental neuroanatomy and behavioral neuroscience. Typically, no more than 10 students, including first-year doctoral candidates, postdoctoral fellows

and doctoral students from other departments, participate in the doctoral laboratory courses.

F. Center for Neural Science Office

The CNS Office is on the 8th floor of Meyer Hall. Amala Ankolekar, Associate Director of the Center; and a full staff, maintain oversight of Center activities and manage the day-to-day operations of the Center. Ms. Vik Keenan, Administrator of Student Affairs, is the contact person for matters of concern to the graduate program.

G. Center for Neural Science Library

The CNS maintains The Laura Jackson Library that has a small collection of journals and books relevant to neuroscience. The library is run on an honor system. Please be sure to sign your name in the register for all borrowed books. And please return books when you are through with them. <http://localweb.cns.nyu.edu/CNSLibrary.html>

H. NYU Libraries

Your ID card gives you access to all NYU Libraries, including the NYU Medical Center Library, at 550 First Avenue. You may also use the libraries at Cooper Union and the New School for Social Research. Reading but not lending privileges are available at CUNY Graduate Center and Columbia University. Check with the reference desk on the first floor of Bobst Library for other information regarding special services at Bobst and at other nearby libraries. <http://library.nyu.edu/>

IV. GENERAL INFORMATION

A. Financial Aid.

Funds to support doctoral candidates in the Center for Neural Science are derived from CNS Stipend funds; Training grants; NYU, US Government and Private Fellowship Awards; and Research Grants. Support for the first year is normally in the form of a Fellowship or Traineeship, supported by CNS or USPHS Training Grant funds. In subsequent years, student support is derived from Training Grants; individual Fellowships and Research Assistantships. Ordinarily, students beyond the second year of study will be supported, at least in part, by Research Grants awarded to the laboratory in which the dissertation is carried out. Students are also actively encouraged to seek fellowship support from such outside sources as NSF, NIH, and DoD.

It is our hope that students in good standing will be supported throughout their period of doctoral training; usually for five years. CNS Stipend Funds are also used to supplement Government Fellowship Awards (NRSA) and Training Grant stipends. While these funds may on occasion be used to supplement NRSA or other fellowships beyond the second year, they can not be used to support students beyond the fifth year of study.

B. Stipends and Income Taxes

Students who receive stipend payments through the GSAS Stipend Payroll will receive checks in their CNS mailbox or may enroll in Direct Deposit through the Payroll Office. This includes students who are supported by Traineeships, individual Fellowships or by the budget of the Center. It does not include students whose support is derived from Research Grants (see below).

The stipends are categorized as "fellowship support" while you are in training, not as "salary for services rendered." Because the Internal Revenue Service does not require that the University report "fellowship support," you will not receive W-2 forms. Nevertheless, such income is taxable; and although the IRS will not have received a record of your stipend income from NYU, they expect that it will be reported when you file your tax return. (There is no guarantee that they may not request retroactive information from the University in the future.)

Because the Center's records are for the academic year, which includes part of two tax years, you will have to consult your check stubs to determine the amount received during the fiscal year.

Research Assistants are paid with funds derived from research grants. They are paid bi-weekly; checks are delivered to the Center. Their stipends are regarded by the IRS as "salary for services rendered;" the income is reported, and W-2 forms are issued annually by the University.

For more information see

<http://www.nyu.edu/gsas/Admissions/Financial.html>

C. ID Card and Keys

An NYU ID card is required of all students for several reasons, the most important being access to CNS and all other University facilities. It is issued by the NYU ID Center found at 383 Lafayette Ave on the corner of West 4th Street.

Keys are issued as needed for student offices and rotation labs. See Stuart for more information.

D. Housing

The Graduate School of Arts and Science offers students a variety of housing options through the University Office of Housing and Residence Life, 8 Washington Place, 212-998-4600.

E. Electronic Mail

All students need Internet (cns.nyu.edu) accounts. See Paul Fan, the Senior Systems Programmer, to establish an account. Be prepared to provide a login name and a password. The latter must be 6-8 characters of mixed upper and lower case, at least one of which is not alphanumeric. Paul also runs a short introductory course on the UNIX environment for new students in the fall of each year.

F. Mail

CNS students are assigned mailboxes in the mailroom. Please check your mailbox for memos from the Program. Faculty and staff mailboxes are in the same location. Also in the mailroom are boxes for outgoing business mail and interoffice mail. *Note that University policy prohibits the use of NYU mail services for your personal incoming and outgoing mail.*

G. Telephones

Student offices are equipped with telephones. To call other offices within the University, dial the last five digits of the telephone number. Outside calls within the five boroughs may be made by dialing 9, the area code, and then the number *Directory assistance is not available.*

All other calls are long-distance, and can be placed only by faculty or staff. Please see them for assistance with business related calls. Collect and credit card calls can not be placed from University phones. Please do not use the CNS office phone numbers for receiving your personal messages.

H. Photocopying

The Center is equipped with a copying machine, located in the mailroom. Operation of the machine requires an ID number. Students may do a reasonable amount of copying without charge. Please get instructions and an ID number from the office staff.

V. INVENTORY OF GRADUATE COURSES

Neural Science Core Curriculum: The Center for Neural Science offers a two-semester core curriculum to be taken by all candidates for the Ph.D., ordinarily during the first year. Courses include Cellular, Molecular & Developmental Neural Science; Mathematical Tools for Neural Science; Sensory & Motor Systems; and Cognitive & Behavioral Neural Science. These are lecture courses that meet twice a week for two-hour lectures by the Center for Neural Science faculty. In addition, a laboratory course in Neural Science is given each semester. This is a weekly six-hour teaching laboratory that introduces students to modern research techniques in neuroscience. Students also do research rotations in two different laboratories during the first year. The first rotation involves at least 15 hours per week, between October and May. The second rotation is a full-time commitment during the summer of the first year. First year students discuss the rotation research at tutorial seminar that meets semi-weekly on Friday afternoons. Finally, students attend the Seminar in Current Topics, a weekly one-hour research colloquium, given either by a Center for Neural Science faculty member or by an outside speaker; and the Fellows' Seminar, a monthly seminar at which CNS Fellows present their research to the entire CNS community.

G80.2201. **Cellular, Molecular and Developmental Neural Science.** Open to doctoral candidates in fields relevant to neural science. Feldman. 4 points. A team-taught Fall semester proseminar that meets twice a week.

G80.2202. **Sensory and Motor Systems.** 4 points. A team-taught spring semester proseminar that meets twice a week.

G80.2203, G80.2204. **Laboratory in Neural Science I, II.** Open to doctoral candidates in fields relevant to neural science. Semple. 3 points per semester. A team-taught course that meets once weekly for 6 hours. Students receive hands-on training in the techniques of modern neuroscience in a laboratory with outstanding facilities for topical experimentation in neurophysiology and biophysics, neurochemistry, experimental neuroanatomy and behavioral neuroscience.

G80.2205. **Cognitive and Behavioral Neural Science.** 4 points. G80.2202. A team-taught spring semester proseminar that meets twice a week.

G80.2210, G80.2211. **Introduction to Research.** Open only to doctoral candidates in neural science. 3 points per semester. This is the research component of the first year core curriculum in Neural Science. Students participate in the research activities in several different laboratories to learn current questions and techniques in neuroscience. They also become acquainted with research in the Center's laboratories, and can make more knowledgeable choices of research area and Advisor. Performance is evaluated on the basis of learning the literature and proficiency in lab techniques, based on oral and/or written presentations with the lab group.

G80.2221. **Mathematical Tools for Neuroscience.** Simoncelli. 4 points Basic mathematical techniques for analysis and modeling of neural systems. The course includes homework sets based on the Matlab software package.

G80.2522. **Function and Dysfunction of Central Auditory Processing.** 3 points This course will explore the relationship between central auditory physiology and psychoacoustics, and those elements of the central auditory system that may change with deafness.

G80.3201. **Special Topics in Neural Science.** 3 points per semester Advanced seminars led by the faculty to provide in-depth consideration of specific topic areas in neural science.

G80.3202. **Special Topics in NS: Neurobiology of Vision and Hearing.** Movshon & Semple. 3 points. Explore the similarities and differences between processing of visual and auditory information, using information from both biological, behavioral, and computational techniques.

G80.3042. **Mathematical Aspects of Neurophysiology.** Rinzel. 3 points This course provides a mathematical introduction to the biophysical mechanisms that underlie neuronal function. Both analytic and numerical methods will be developed and used in the course, and course-related computing projects are anticipated.

G80.3235. **Information Processing and Visual Pathways.** Shapley and colleagues. 3 points. Seminar and lecture course in visual signal processing and visual pathways. The aim of the course is to reach an understanding of vision from a systems analysis point of view. Readings are from research papers and some secondary sources. Students present critical reviews of one of

the papers on the reading list. A paper is required by the end of the course on a topic mutually agreeable to student and instructor.

G80.3236. **Classic Papers in Vision.** Research Krauskopf. 3 points. Reading and discussion of important papers in vision. Each student leads the discussion of one or more papers.

G80.3241. **Behavioral Neuroscience.** LeDoux, Matthews. 3 points. Survey of basic areas in behavioral neuroscience. Topics include instinctive behavior; conditioning; motivation; emotion. Lectures cover methodological issues and development of current perspectives. Students present papers on currently active areas of relevant research.

G80.3301. **Dissertation Research and Seminar.** 1-3 points per semester.

G80.3305. **Reading Course in Neural Science.** May be taken more than once for credit. 1-3 points per semester.

G80. 3310. **Beyond Filtering: Selected Topics in Visual Perception.** Rubin 3 points (Spring semester, every two years) A critical examination of modern approaches to vision research. Emphasis on the interplay between theory and experiment.

G80. 3322. **Research Problems in Neural Science.** May be taken more than once for credit. 1-3 points per semester.

G80 3331. **Neural Control of Movement.** May be taken more than once for credit. Glimcher. 1-3 points.

G80.3390. **Seminar in Current Topics.** 2 points per semester. A weekly one-hour research colloquium at which major research developments are presented by speakers from other institutions in the US and abroad. The colloquium meets at the Center for Neural Science and at NYU Medical Center on alternate weeks. Trainees of the Center are hosts for lunch (paid for by the Center) with the speaker when the seminar meets at the Center. Faculty does not attend the lunches.

For current course listing see
<http://www.cns.nyu.edu/doctoral/courses.php>